A SPRING WIRE THAT'S A "NATURAL" for new automatic coiling and knotting machines

The bedding and furniture spring industry takes a long step forward with the new automatic coiling and knotting machines which, by a continuous operation, deliver cross helicals, double-cone innersprings and single-cone bed springs completely formed for assembling into bedding and furniture units.

The operation is a real test of quality for any spring wire. In order to maintain the high rate of automatic production the wire must feed through the machines without slipping or binding. It must take the coiling consistently close to dimensions. It must work uniformly in the knotting or hook-forming operations and must respond uniformly to the cut-off.

Manufacturers using these new machines state that J&L MASTERCRAFT Spring Wire is the "natural" for them. The reason is — J&L MASTERCRAFT leads in uniformity of temper, finish and accuracy of size — the result of the J&L Controlled Quality methods of manufacturing.

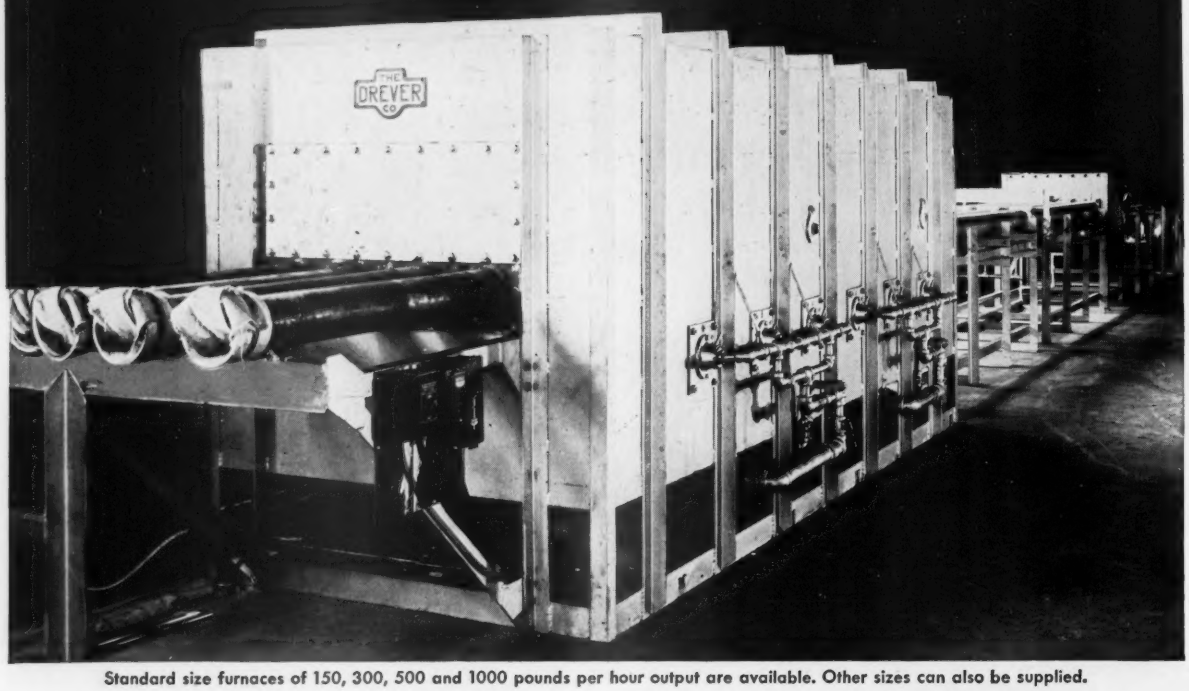
JONES & LAUGHLIN STEEL CORPORATION

AMERICAN IRON AND STEEL WORKS
PITTSBURGH, PENNSYLVANIA

J&L — PARTNER IN PROGRESS TO AMERICAN INDUSTRY

J&L STEEL

BRIGHT ANNEALING STAINLESS STEEL, MONEL & INCONEL (SEAMLESS OR WELDED) TUBING



Standard size furnaces of 150, 300, 500 and 1000 pounds per hour output are available. Other sizes can also be supplied.

EXPERIENCE POINTS TO THE DREVER CO

THE DREVER COMPANY has pioneered in the development of furnaces for bright annealing stainless alloys. The continuous furnace for bright annealing stainless tubing shown above, is representative—city gas fired, it was supplied complete with cooling tubes, charging tables, the proper seals and conveying mechanism. This unit is adaptable for use on a wide range of tubing sizes, giving maximum operating efficiency and a clean bright anneal on all types of tubing. Ruggedly constructed and insulated for continuous use, this furnace gives uniform controlled temperatures—a direct result of Drever design.

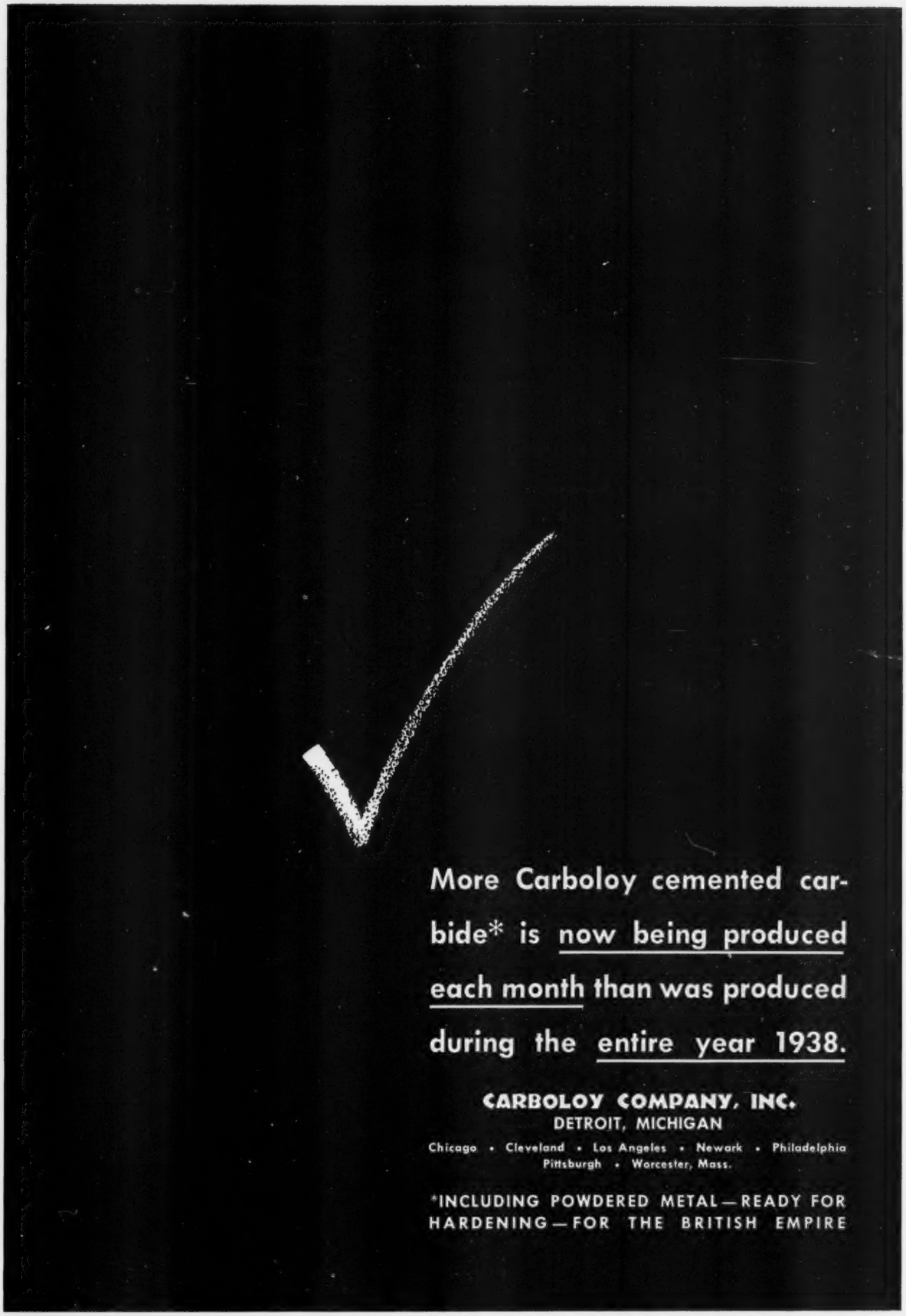
If your production involves bright annealing stainless alloys of any kind—wire, tubing, sheet, plate, fabricated assemblies, etc., get in touch with The Drever Company. We will gladly discuss your problems with you.

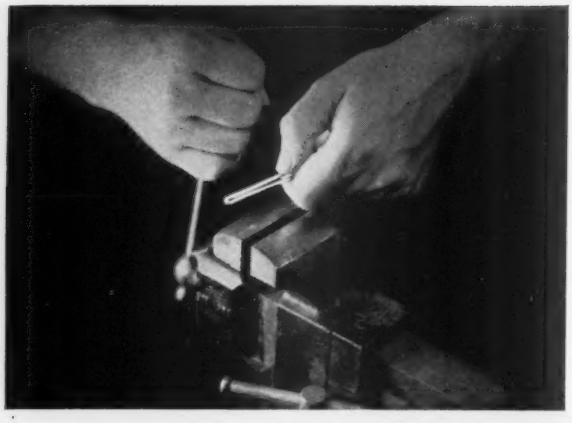
Write for any or all of these new Drever Bulletins—

B-3—Industrial Furnaces
B-4—Bright Annealing Stainless Steels
B-5—Ammonia Dissociation Equipment
B-2—Process for Surface Hardening Stainless Steels
B-1—Process Kettles

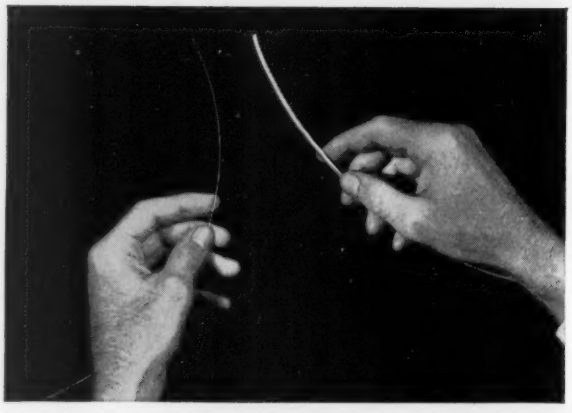
THE DREVER CO.
770 E. VENANGO ST.
PHILADELPHIA, PA.

. . . Designers and Builders of Specialty Furnaces


More Carboloy cemented carbide* is now being produced each month than was produced during the entire year 1938.
CARBOLOY COMPANY, INC.
DETROIT, MICHIGAN
Chicago • Cleveland • Los Angeles • Newark • Philadelphia
Pittsburgh • Worcester, Mass.
*INCLUDING POWDERED METAL—READY FOR HARDENING—FOR THE BRITISH EMPIRE



A hairpin bend...
a pigtail twist...
a 90% area reduction



They won't harm a bethanized coating

Have you ever thought about bethanized wire . . . and your product . . . and wondered if you couldn't combine them profitably?

If you now make a product out of uncoated wire, and apply the zinc after fabrication to avoid flaking or peeling, then bethanized wire can save you both time and money. Users of bethanized wire have found that the bethanized zinc coating is flake-proof under virtually any commercial forming operation. You can bend bethanized wire flat back upon itself, twist it into a pigtail, draw it through dies to a fraction of its size, without harming the zinc coating in any way or reducing the percentage of zinc to steel.

The secret of this unusual tightness and ductility lies in the bethanizing process itself. The zinc is applied to the wire by an electric current. There is no in-between layer of zinc-iron alloy. The coating is 99.9+ per cent pure, ductile as gold leaf, and uniform in thickness both along and around the wire. Furthermore, the bethanizing process can apply virtually any weight of zinc within practical limits. Standard bethanized "B" and "C" coatings are twice and three times as heavy as specifications call for in a standard double galvanized coating.

Get the facts on bethanized wire by writing to Bethlehem Steel Company, Bethlehem, Pa. We'll send you a descriptive folder, covering manufacture, properties and uses. No cost or obligation involved.

BETHANIZED WIRE

BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY

NEW -- BETTER -- FASTER

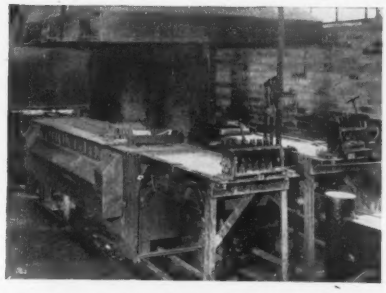
The *Trauwood* PROCESS

TEMPERING PATENTING ANNEALING

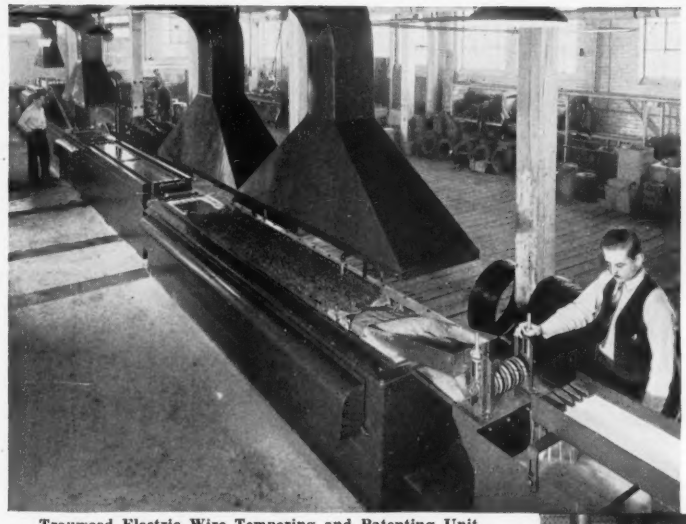
Modern industrial applications for steel wire and strip demand the use of material possessing the highest possible physical and fatigue properties. Scientific heat treatment, as practised in the *Trauwood* process, develops the maximum physical properties of a given steel, opening new fields of application.

The *Trauwood* process for the continuous patenting, tempering and annealing of steel wire and strip utilizes a new principle of heating—the heating effect of an electric current is employed to heat the wire rapidly and uniformly through the cross section to the required temperature.

. . . High temperature furnaces and lead pots with their excessive maintenance costs are eliminated.



Trauwood Electrically Heated Galvanizing and Tinning Pots.



Trauwood Electric Wire Tempering and Patenting Unit.

OUTSTANDING ADVANTAGES

- Higher and more uniform physical and fatigue properties.
- No surface decarburization or scale.
- Faster wire speeds . . . greater production.
- Equipment fully automatic and easy to operate.
- Control of heating and cooling cycles extremely accurate.
- Thermal efficiency of the process very high.
- Much finer grained structure possible.
- High quenching temperatures rapidly attained.
- Adaptable to high alloy and austenitic steel wire and strip (annealing of stainless).

Trauwood Electric Wire Tempering Unit Showing Control Panel.

The *Trauwood* Process, new in principle, eliminates high temperature furnaces and lead pots with their excessive maintenance costs and low thermal efficiencies. More positive temperature control is possible and quenching is done on a rising temperature—instead of falling, as in conventional heat treating methods. The rapid rate of heating (4 to 5 times as fast as furnace heating) increases production and uniformly produces a finer grained product with higher physical and fatigue values.

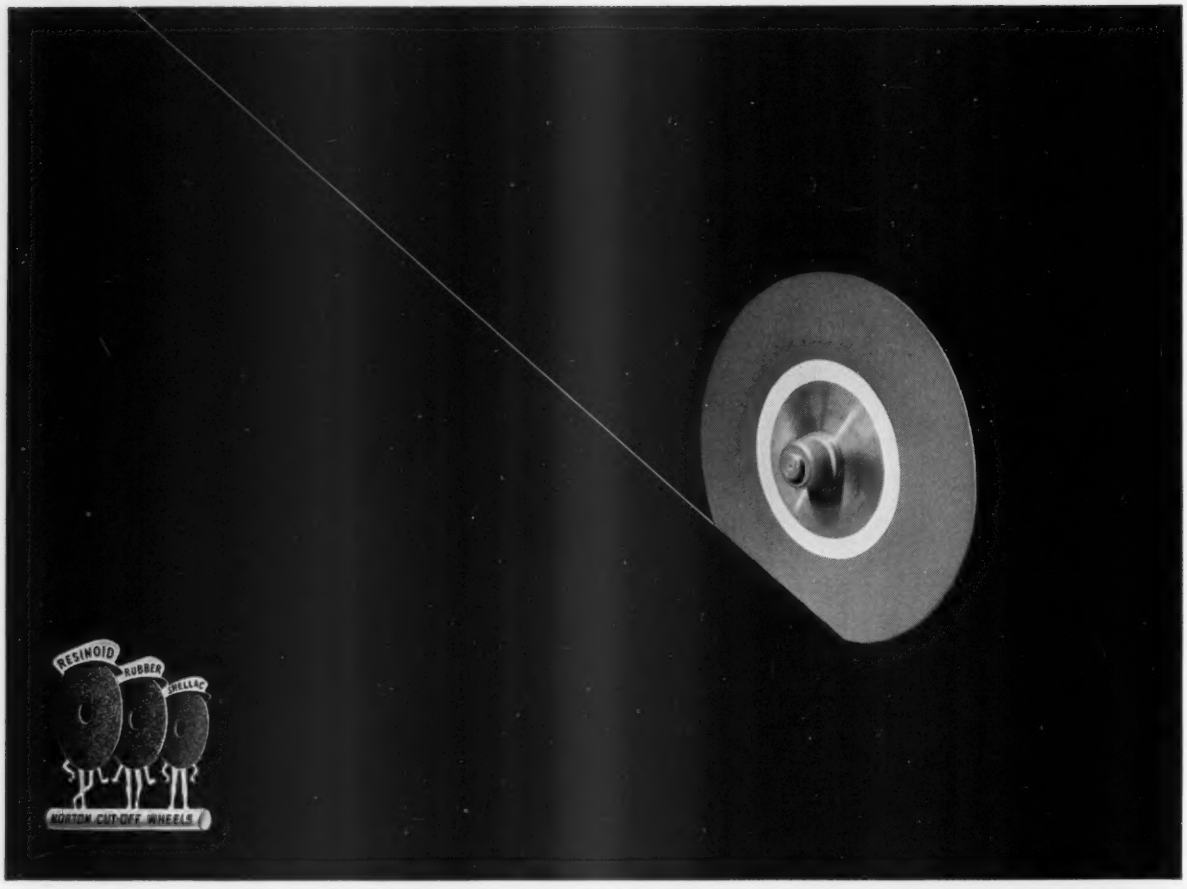
Wire and rod patented by the *Trauwood* Process insures easier drafting, makes heavier reductions possible. With *Trauwood* patenting equipment, pickling costs are materially reduced as compared with ordinary methods.

Complete details of the *Trauwood* Process will be furnished you on request. Our engineers will help you solve your continuous wire and strip patenting, tempering and annealing problems. Write today.

Patented in U. S. A. and Foreign Countries

THE TRAUWOOD ENGINEERING COMPANY

1740 E. 23rd STREET, CLEVELAND, OHIO, U. S. A.



Are You Taking Full Advantage of Cut-off Wheels?

There's a Norton Abrasive and Bond for Each Cutting Job

Resinoid Bond is usually first choice for metals when a fast cutting action plus long wheel life are desired and where some burr is not objectionable; also for the dry cutting and slotting of concrete, plastics, fibre and other non-metallic materials. Norton research combined with Norton control in manufacture have resulted in a Norton Resinoid Cut-off Wheel that is outstanding in performance.

Rubber Bond is the choice where minimum burr is essential and for most wet cutting jobs—both metallic and non-metallic materials. For this work, too, Norton research has developed an outstanding wheel.

Shellac Bond is most used in the tool room where its soft, free grinding action is an advantage in cutting tool steels without discoloration.

You can be sure that one or more of these Norton bonds with either Alundum or Crystolon abrasive will handle your cut-off jobs. And a Norton engineer will be glad to help you.

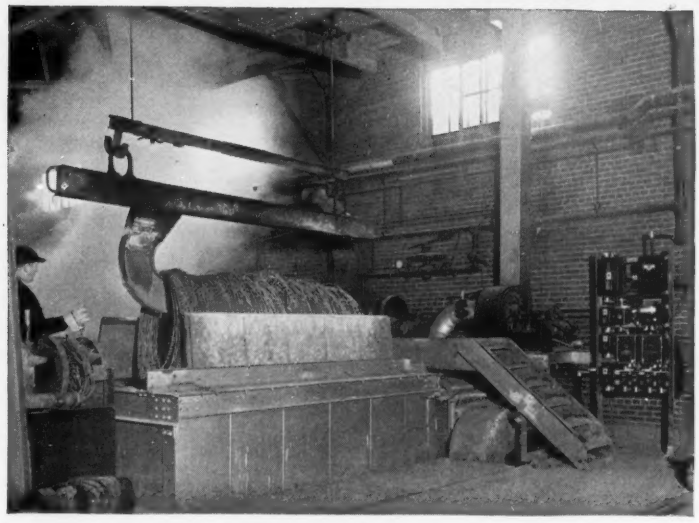
The booklet "Norton Cut-off Wheels" contains much helpful information and it will be sent free on request.

NORTON COMPANY
Worcester, Mass.

W-798

NORTON ABRASIVES

Serving England!



THESE TEST FIGURES

made at

JOHNSON & NEPHEW LIMITED

SUPPORT OUR CLAIMS FOR CARL-MAYER *Speed*

3 and 2¾ Minutes

Every minute means so much to Johnson & Nephew, Limited, — and England—that they chose Carl-Mayer Ovens for faster and better rod baking.

Carl-Mayer Hi-Speed Rod Bakers, patented and patents pending, are selling themselves on their merit and amazing fuel economy. Another of their important advantages is the Patented Blow-Off Feature which removes moisture without bumping or agitating the coils. Write for full particulars NOW.

RECENT INSTALLATIONS IN U. S. A. AND CANADA & ENGLAND

- Allegheny-Ludlum Steel Co.
- Atlantic Wire Co.
- Johnson & Nephew, Limited
- Pittsburgh Tool Steel Wire Co.
- Steel Company of Canada
- Wickwire-Spencer Steel Co.

" ROD BAKER " JOB - Rd. Johnson & Nephew

Preliminary warming up and trial on 18th, showed that with approximately 2,600 ft. gas per hour, the Baker would reach required temperature (614°F) and the first trial rods (fully loaded pin) were dried satisfactorily in 3 and 2-3/4 minutes even if charged into the Baker dripping wet from Lime Tank.

This in presence of Mr. Bedson.

It was decided to run the Baker on production Saturday 19th.

Lit up 8.20 a.m. Meter = 11760

PIN NUMBER	/WEIGHT (RODS ONLY) T.	C.Q.	lbs.	/TIME IN	/TEMP°F.	/TIME OUT	/TEMP°F.	/TIME/METER & PER PIN	REMARKS
1	1.	5.0	0	8.51	540	9.00	580	9 mins.	11,760
2	1.	9.1	0	9.04	590	9.10	610	6 mins-Main Pressure 4¼	
3	1.	9.2	0	9.17	610	9.21	615	4 mins-Gas Pressure =3-3/4"	
4	1.	14.3	10	9.23	620	9.28	620	No. 1 Baker off.	
5	1.	3.0	0	9.33	615	9.35	620	5 mins. 14,360 = 2600 ft. hour	
6	1.	6.0	0					2 mins. Gas Pressure = 3-3/4"	
7	1.	3.2	0	9.44	620	9.59	625	after No. 1 Baker lit up	
				10.02	620	10.16	624	14 mins.(Main Pressure = 3-3/4")	
8	1.	10.0	0					14 mins.(waiting for truck or	
9	1.	6.0	0	10.21	620	10.25	624	H.C.Steel	
				10.27	615	10.30	610	4 mins.	
10	1.	12.0	0					3 mins. - 2800 cu. ft. hour	
11	1.	6.2	0	10.30	-	-	-	17,250 at 10.23 approx.	
12	1.	6.0	.20	10.40	610	10.43½	600	-	
13	1.	5.0	0	10.45	610	10.47	600	3½ mins.	
				10.52	625	-	-	2 mins.	
14	1.	5.3	12					-	
15	1.	4.2	6	11.01	550	11.03	-	18880. shut down to	
16	1.	2.0	18	11.04	600	11.06	590	instruct their man to light up	
17	1.	6.0	0	11.07	590	-	585	2 mins.	
calculated on avge.				11.14	590	-	590	2 mins.	
18	1.	6.3	0					-	
				11.18	590	11.22	580	-	11.36
Total 24.	2.0.10/			/8.51 to 11.22/				4 mins. 20.500 shut down	

= 2½ hours/working/from 3 hours lit up

Output during working time = 9 tons 13 cwts. per hour

Gas used during working time = 6,700 cu.ft. (Total gas

Gas used after working time = 700 cu.ft. (average = 2,680

Gas used during heating up = 1,340 cu.ft. (- 8,740 cu.ft. per hour

Gas per ton working time = 278 cu.ft.

Gas per ton (working time) = 329 cu.ft.

(& heating up)

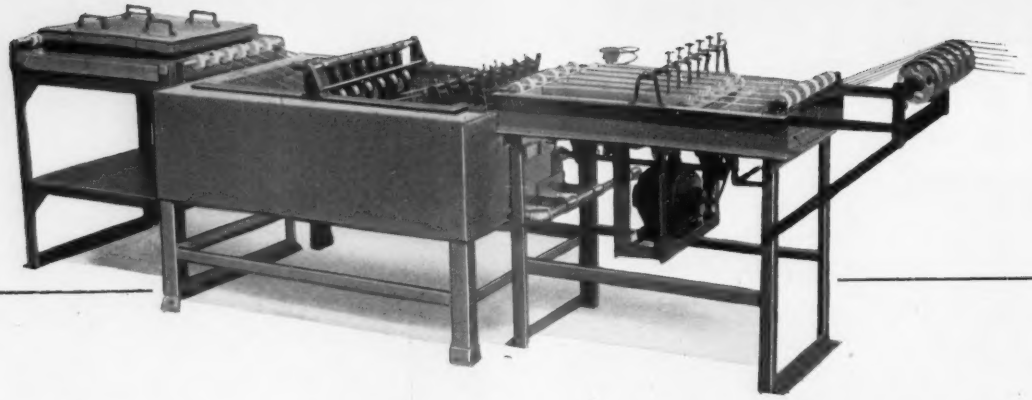
Note: Hourly tonnage and gas per ton will obviously depend on proportion of Mild and High Carbon Steel Rods baked. The latter requiring a longer time (up to 18 mins. per batch) to De-Hydrogenate and/or "blue".

Note: This figure will vary according to proportion between heating up time and total hours work i.e. would be less taken on 1 light up and a full day's operation.

CARL-MAYER HI-SPEED TRADE MARK ROD BAKER

CARL-MAYER CORPORATION, 3030 EUCLID AVE., CLEVELAND, O.

Industrial Ovens, Rod Bakers, Industrial Furnaces, Welding Rod Ovens



Syncro offers . . . . . .

Tinning equipment of most modern design

The Syncro tinning equipment, consisting of an acid applier, tin pot with wipers and a cooling zone, is completely modern in every respect. Accessibility and operating efficiency are stressed in this equipment.

For instance, the number of bends required in the wire line are reduced to the minimum.

The individual wiper units can be raised for servicing and the wipers can be changed while the wire is in motion.

The fixed tin pot deflecting shoes are circular, providing a wearing surface of 360 degrees, which adds greatly to their life.

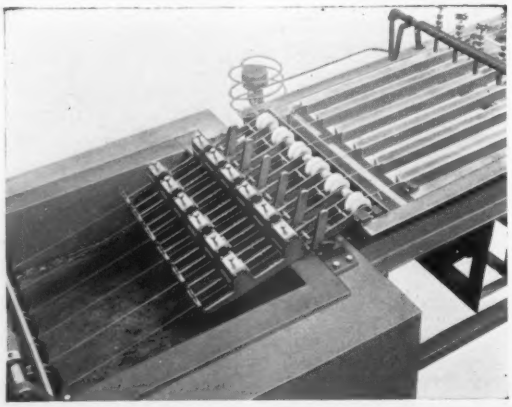
The straight line recirculating type cooling zone is equipped with temperature controls which automatically maintain the water at the correct temperature.

These and other advantages make Syncro Tinning equipment highly efficient, economical and they insure a uniformly high quality product.

SYNCRO MACHINE COMPANY

Rahway, New Jersey — McCormick Bldg., Chicago

Represented in Canada by — Canadian Elevator Equipment Co., Ltd., Toronto



UPRIGHT ★ ★ ★

★ ★ ★ CONE

Wire Drawing Machines

FOUNDED WATERBURY FARREL 1851

These high speed machines are available in several sizes and can be had with either a coiling block or spooler. The spooler may be an attachment or a separate floor-type device, such as shown. This is the No. 4 machine with belt-type cradle spooler. It is driven by a direct-coupled motor (not shown), has 13 dies and capacity for drawing copper from ¼" maximum starting size down to a finishing size of from No. 10 to No. 18 B. & S. gage. The dies and the hardened steel drawing rolls are enclosed by a rolling steel curtain to confine the splash of the drawing lubricant.

WATERBURY-FARREL
FOUNDRY & MACHINE COMPANY
Waterbury, Connecticut, U. S. A.
SALES OFFICES CHICAGO CLEVELAND NEWARK, N. J.

The insistent demand for *more, more and more production* has brought Vascoloy-Ramet Dies into the spotlight.

The test of urgency has proved that Vascoloy-Ramet Dies are definitely superior for steel, copper, bronze and alloys, drawing smoother wire with longer uninterrupted runs, fewer shut-downs for die changes.

For intermediate and fine wire sizes, Vascoloy-Ramet Blue Ribbon Dies save their slight extra cost many times over.

Call in a Vascoloy-Ramet factory representative today and get his suggestions.

VASCOLOY-RAMET CORPORATION

NORTH CHICAGO, ILLINOIS

An affiliate of

FANSTEEL METALLURGICAL CORPORATION

and

VANADIUM-ALLOYS STEEL COMPANY

Factory-Owned Branches: Jersey City ... Detroit ... Cleveland ... Buffalo ... Syracuse ... Pittsburgh ... Cincinnati ... Hartford ... Providence ... Philadelphia ... St. Louis ... Milwaukee

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Vascoloy RAMET

T M REG. U. S. PAT OFF

THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE DIES

Defense wire Production

calls for

- ✓ SPEED
- ✓ FLEXIBILITY
- ✓ SAFETY
- ✓ DEPENDABILITY

and these demands call for...

COMPLETE
WIRE DRAWING EQUIPMENT

CONTINUOUS OR SINGLE HOLE
. . . FOR THE LARGEST BARS
. . . FOR THE SMALLEST WIRE
. . . FERROUS, NON-FERROUS
MATERIALS OR THEIR ALLOYS

Vaughn

Illustration shows Special Motoblox for Stainless and other "fussy" alloys. Made with 2, 3 or 4 blocks, with special interlocking control that permits single or multiple drafting at will. Special air and water-cooling features are provided.

THE VAUGHN MACHINERY CO.

CUYAHOGA FALLS, OHIO, U. S. A.

READY FOR THE BIG JOB

It's a Continuous Wire Drawing Machine . . . *and we mean CONTINUOUS!*
Because rods run from a reel can be welded without stopping production. Clutches on intermediate blocks permit No. 1 block to be stopped with finishing block running while weld is made.

It's a *Production* Machine for high carbon as well as low carbon stock—
Because the high block design provides a time interval between drafts, and dissipation of heat in the wire is accomplished by a continuous blast of cool air.

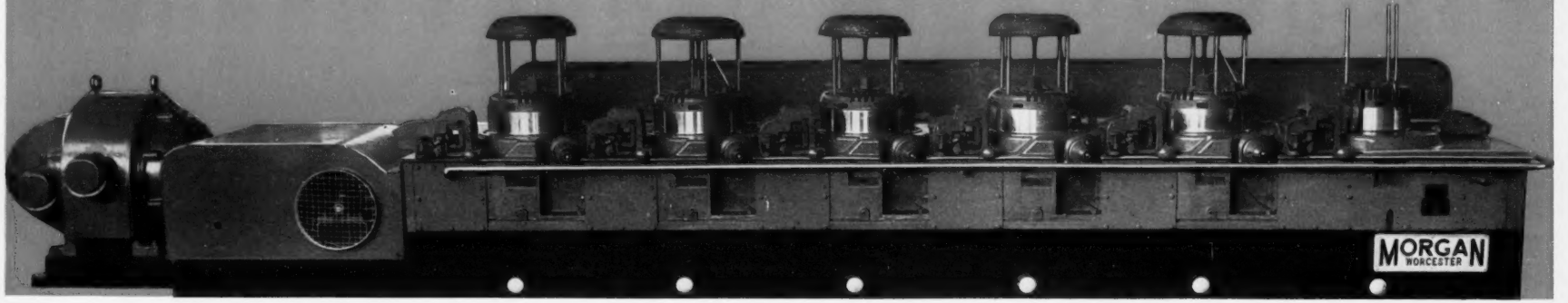
It's an *Economical* Machine—
Because it's unit powered for highest efficiency; compact, to occupy minimum floor space; equipped with modern safety features; and built to stand up year in and year out in three-shift operation.

MORGAN WORCESTER ENGINEERS AND MANUFACTURERS

W-62

MORGAN CONSTRUCTION COMPANY, WORCESTER, MASS.
Continuous Wire Drawing Machines; Take-up Frames; Horizontal Bull Blocks; Vertical Spindle Bull Blocks; Reels; Pointers; Wire Mill Accessories

MORGAN-CONNOR WIRE MACHINES



WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 16 JUNE, 1941 No. 6

Designated as

Official Publication By The Wire Association

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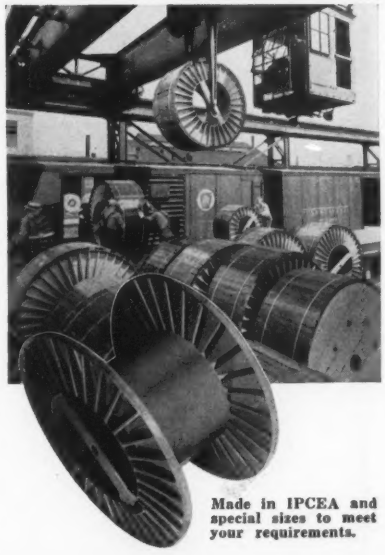
Stevens

LOW-TARE
Shipping Reels
and
FLANGED STEEL DRUMS



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ALL STEEL Construction
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LOW WEIGHT and
LONG LIFE ECONOMIES

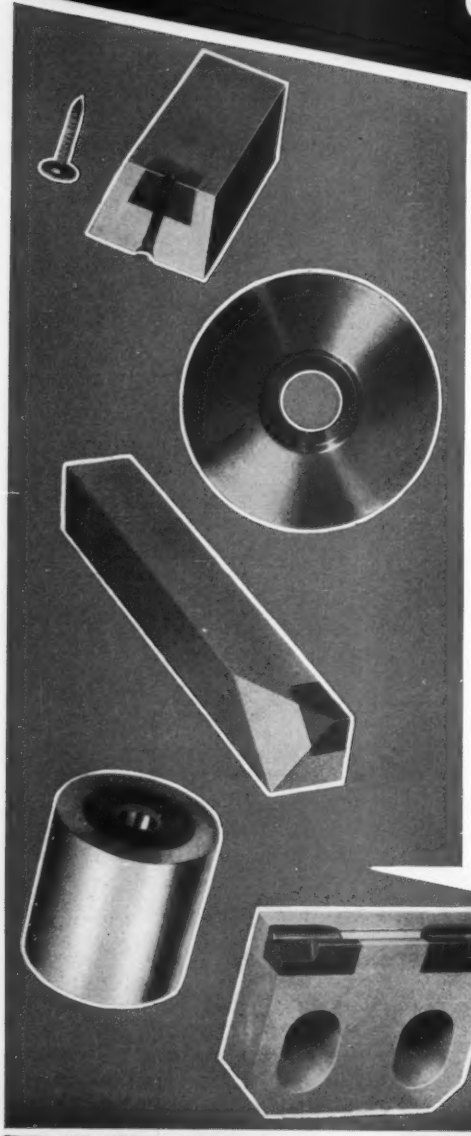
They are built to last—sturdy at the hub, and engineered with shock absorbing characteristics to withstand side stress. Write for interesting data and prices.

Manufactured under license arrangements with Western Electric Company, Incorporated

THE STEVENS METAL PRODUCTS CO.,
NILES, OHIO

FIRTHALOY IS READY

... for Unlimited Emergency Production!



Only Dies of Sintered Carbide (FIRTHALOY) can "take" the abuse imposed by 24 hour-a-day emergency schedules — drawing, shaping, cold-heading, forming and finishing vital defense products—and still maintain maximum production with close essential tolerances. Firthaloy Dies and Tools are available in the following regularly manufactured forms:

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TUBE DRAWING DIES	MANDRELS
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COLD HEADING DIES	SHAPING DIES
EXTRUSION DIES	SWEDGING DIES
SPRING FORMING TOOLS	GUIDES
QUILLS AND CUT-OFFS	BUSHINGS
EYELET AND FERRULE DIES	
COATING DIES	STRANDING DIES
NAIL DIES	HEADING HAMMERS

Firthaloy engineers are prepared to render helpful service in applying Sintered Carbide Dies to your production problem.

FIRTH-STERLING STEEL COMPANY

OFFICE AND WORKS:
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BRANCH WAREHOUSES:
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HARTFORD PHILADELPHIA
LOS ANGELES DAYTON
CLEVELAND DETROIT

WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 16 JUNE, 1941 No. 6

Mathematics For The Wire Mill

By Daniel Neuman,

Industrial Fellow, Mellon Institute of Industrial Research,
Pittsburgh, Pennsylvania

On several occasions wire mill production men have requested special tables and charts for specific purposes. By making use of the proper combination of the items outlined below, it is possible to secure the information desired in relatively short time.

✦ ✦ ✦ ✦ ✦

ONE of the most useful tools to have on your desk when old specifications are revised or new specifications are being introduced is a set of formulas and equations that make the solving of mathematical problems reasonably simple and easy to do. It is the intention of this article to set forth the very fundamental useful, and at the same time usable, formulas and equations that are most frequently needed for solution of wire mill problems.

✦ ✦ ✦

MOST of the information set forth in this paper may be found in the various handbooks, charts, tables and private files on subjects not necessarily connected with the wire industry. However, to the best of my knowledge, no previous attempt was ever made to collect these separate facts and to present them in a concise tabulated form.

✦ ✦ ✦

ON several occasions wire mill production men have requested special tables and charts for specific purposes. By making use of the proper combination of the items outlined below, it has been possible to furnish the information desired in a relatively short time.

✦ ✦ ✦

THIS ready reference may serve as a partial test in the training courses offered to potential wire mill assistants and foremen.

✦ ✦ ✦

NO special knowledge of the slide rule or calculating machine is necessary since all of the problems involving the general type formulas may be solved with paper and pencil. However, for those familiar with the slide rule or other mechanical method, it will be found that the equations and formulas are in the proper form for ready transposing for solution.

✦ ✦ ✦

LATER articles will deal with specific problems illustrating how combinations of equations may be used to solve the more complex problems.

DANIEL NEUMAN

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Designated as Official Publication by the Wire Association

(1) % Draft = The percent reduction in cross sectional area of the rod or starting material.

THIS may be expressed as follows:

$$\% \text{ Draft} = \frac{\text{Area of Rod} - \text{Area of Wire}}{\text{Area of Rod}} \times 100\% = dA$$

Given the following, as an example:

Rod Gauge = #5 (.218″) Area = .037325 sq. in.
Wire Gauge = #8 (.162″) " = .02061 sq. in.

$$\text{Then } \% \text{ Draft} = \frac{.037325 - .02061}{.037325} \times 100\% = 44.78\%$$

✦ ✦ ✦

FOR round sections, we may use the square of the diameter, expressed as D^2 in place of the area for the purposes of calculations.

✦ ✦ ✦

THUS the above equation becomes:

$$\% \text{ Draft} = \frac{(\text{Dia. of Rod})^2 - (\text{Dia. of Wire})^2}{(\text{Dia. of Rod})^2} \times 100\%$$

or abbreviated, it becomes

$$\% \text{ Draft} = \frac{D_R^2 - D_W^2}{D_R^2} \times 100\%$$

This may be simplifed to read:

$$\% \text{ Draft} = \left(1 - \frac{D_W^2}{D_R^2}\right) \times 100\%$$

or $dA = \left(1 - \frac{D_W^2}{D_R^2}\right) \times 100\%$, where dA = % Draft

✦ ✦ ✦

USING the same example as above, we have

$$\% \text{ Draft} = \left(1 - \frac{(.162)^2}{(.218)^2}\right) \times 100\% = 44.78\%$$

✦ ✦ ✦

(2) Elongation — The increase in length due to decrease in cross-sectional area during drafting.

SINCE the volume, for all practical purposes, before and after drafting is the same, we may set up the following relationship:

(a) $\frac{\pi}{4} D_R^2 L_R = \frac{\pi}{4} D_W^2 L_W$, Where $\pi = 3.1416$

D_R = Dia of Rod
D_W = Dia. of Wire
L_R = Length of Rod
L_W = Length of Wire

or

(b) $D_R^2 L_R = D_W^2 L_W$

(c) and then $L_W = \frac{D_R^2}{D_W^2} \times L_R$

However, the formula for % draft (the decimal equivalent) is:

$$dA = 1 - \frac{D_W^2}{D_R^2}$$

or $\frac{D_W^2}{D_D^2} = 1 - dA$

Inverting both sides of this equation, the result is

$$\frac{D_R^2}{D_W^2} = \frac{1}{1-dA},$$

then substituting in (c), we have

$$L_W = \frac{1}{1-dA} \times L_R$$

and for unit starting length, the formula for the elongated length is:

$$L_W = \frac{1}{1-dA}$$

✦ ✦ ✦

(2a) % Elongation = The percent increase in length obtained by the reduction in cross sectional through drafting.

$$\% \text{ Elongation} = \frac{\text{Length of Wire} - \text{Length of Rod}}{\text{Length of Rod}} \times 100\% = \% \text{ E}$$

SUBSTITUTING the (c) expression from the derivation in (2) above for the length of wire, we have:

$$\% \text{ E} = \frac{\left(\frac{D_R^2}{D_W^2} \times L_R\right) - L_R}{L_R} \times 100\%$$

or $\% \text{ E} = \left(\frac{D_R^2}{D_W^2} - 1\right) \times 100\%.$

For example:

Rod gauge = .218″
Wire gauge = .162″

$$\% \text{ E} = \left(\frac{(.218)^2}{(.162)^2} - 1\right) \times 100\% = 81.1\%$$

✦ ✦ ✦

(3) % increase in tensile = The percent increase in tensile strength of the drawn wire as compared with the original rod tensile.

EMPLOYING the nomenclature as above, the equation becomes:

$$\% \text{ Inc. in T} = \frac{\text{Wire Tensile} - \text{Rod Tensile}}{\text{Rod Tensile}} \times 100\%.$$

As an example, suppose the

Rod Tensile = 52,000 lbs. per sq. in. (p.s.i.)
Wire Tensile = 61,000 lbs. per sq. in.

$$\text{Then the \% Inc. in Tensile} = \frac{61{,}000 - 52{,}000}{61{,}000} \times 100\% = 14.75\%$$

(4) Tensile Strength.

$$T.S. = \frac{\text{Breaking Load in Pounds}}{\text{Area of Specimen}}$$

For example, assume

Breaking Load = .802# Area = .003019 sq. in.
Wire Gauge = .062#

Then, $T.S. = \frac{802}{.003019} = 265{,}650$ p.s.i.

✦ ✦ ✦

AN alternate method that is worthy of note in all problems that deal with division is the fact that the problem may be solved by taking the reciprocal of the divisor and multiplying.
The above problem then becomes:

$$T.S. = 802 \times \frac{1}{.00309} = 265{,}650 \text{ p.s.i.}$$

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(5) Feet per minute of wire production on a Block in continuous operation.

Ft./min. = R.P.M. of Block x Diameter of Block x 3.1416.

✦ ✦ ✦

(6) Pounds per hour per foot of Block revolution of steel wire production.

#/Hr./Ft. = (Wire Area) (12) (.283) (60) = (203.76) (Wire Area)

where:

12 = No. of inches per foot
60 = Minutes per Hour
.283 = Weight of Steel in Pounds per Cu. In.

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(7) Pounds per hour per R.P.M. of Block of steel wire produced in continuous operation.

#/Hr./R.P.M. = (Equation 5) x (Equation 6)
or #/Hr./R.P.M. = R.P.M. of Block x Diameter of Block x 3.1416 x 203.76 x wire area
or #/Hr./R.P.M. = 640.13 x R.P.M. of Block x Dia. of Block x Wire Area.

✦ ✦ ✦

(8) Pounds per foot of steel wire.

#/Ft. = (Wire Area) (.283) (12)
or #/Ft. = 3.396 x Wire Area

✦ ✦ ✦

(9) Feet per pound of steel wire.

$$Ft./\# = \frac{1}{\#/Ft.} = \frac{1}{3.396 \times \text{Wire Area}} = \frac{.2944}{\text{Wire Area}}$$

✦ ✦ ✦

(10) Double-Deck Drafting Calculations.

$$\frac{\text{Diameter of Top Block}}{\text{Diameter of Bottom Block}} = \frac{(\text{Dia. of Bottom Wire})^2}{(\text{Dia. of Top Wire})^2}$$

, assuming zero slip condition.

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THIS relationship is established from the following conditions:
Volume of Wire on Bottom Block = Volume of Wire on Top Block,

or, π x Diameter of Top Block x $\frac{\pi}{4}$ Diameter^2 of Top Wire =

π x Diameter of Bottom Block x $\frac{\pi}{4}$ Diameter^2 of Bottom Wire,

or $\pi \times \text{Dia.}_{T.B.} \times \frac{\pi}{4} \times D^2_{T.W.} = \pi \times \text{Dia.}_{B.B.} \times \frac{\pi}{4} \times D^2_{B.W.}$

which simplifies to

$$\text{Dia.}_{T.B.} \times D^2_{T.W.} = \text{Dia.}_{B.B.} \times D^2_{B.W.}$$

or $\frac{\text{Dia.}_{T.B.}}{\text{Dia.}_{B.B.}} = \frac{D^2_{B.W.}}{D^2_{T.W.}}$

where
T.B. = Top Block
B.B. = Bottom Block
T.W. = Top Wire
B.W. = Bottom Wire

✦ ✦ ✦

(10a) Double-Deck Drafting Calculations.

A MORE usable form of this equation is

$$\% \text{ Draft or } dA = 1 - \frac{\text{Dia.}_{T.B.}}{\text{Dia.}_{B.B.}}$$

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THIS relationship is obtained from the definition of % draft substituted in equation (10) as follows:

$$dA = 1 - \frac{D^2_W}{D^2_R} = 1 - \frac{D^2_{B.W.}}{D^2_{T.W.}}.$$

Then

$$\frac{D^2_{B.W.}}{D^2_{T.W.}} = 1 - dA$$

By substitution, equation (10) becomes

$$\frac{\text{Dia.}_{T.B.}}{\text{Dia.}_{B.B.}} = 1 - dA$$

Transposing it becomes

$$dA = 1 - \frac{\text{Dia}_{T.B.}}{\text{Dia.}_{B.B.}}$$

In other words, the % drafting between the two blocks is equal to 1 — the ratio of the diameters of the blocks.

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(11) Uniform % reduction per draft for various total reductions.

$$X = 1 - \sqrt[n]{1 - dA}$$

where
X = % reduction (uniform reduction per draft)
N = Number of drafts
dA = Total percent reduction

Take, for example, a 50% total reduction.
Then for 2 drafts, we have

$X = 1 - \sqrt[2]{1 - .5} = 1 - \sqrt{.5} = .293$ or 29.3% per draft, and for 3 drafts, we have

$X = 1 - \sqrt[3]{1 - .5} = 1 - \sqrt[3]{.5} = .206$ or 20.6% per draft, then for 4 drafts,

$X = 1 - \sqrt[4]{1 - .5} = 1 - \sqrt[4]{.5} = .158$ or 15.8% per draft.

(*Please turn to Page 354*)

X-ray Analysis of Hot-galvanized Heat-treated Coatings

by

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This paper was presented at the meeting of the Institute of Metals Division, American Institute of Mining and Metallurgical Engineers held at Cleveland, Ohio, October, 1940. ✦ ✦

HOT-DIPPED heat-treated zinc coatings on sheet steel were examined with X-rays. The phases identified were compared with those listed in the modern literature of the zinc-iron system. The zeta ($FeZn_{13}$) phase is shown to correspond to the phase found by Schueler (1925) in heat-treated zinc coatings.

✦ ✦ ✦

AN investigation was undertaken to determine the phases present in hot-dipped heat-treated zinc coatings on steel sheets and wire. This kind of coating on wire was studied some years ago by Schueler[1] by microscopic and chemical methods. He reported a new phase, $FeZn_{10}$. Later, Clark and Stillwell,[2] using X-ray crystal analysis, identified a new phase in ordinary galvanized wire, which was assumed to be the $FeZn_{10}$ phase.

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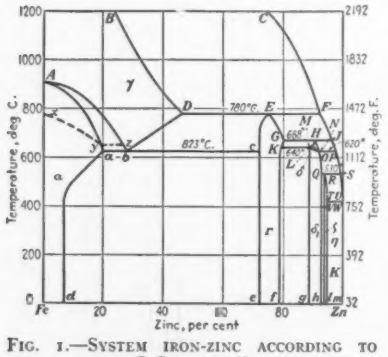

FIG. 1.—SYSTEM IRON-ZINC ACCORDING TO J. SCHRAMM.[11]

Previous Work

SINCE the extensive review of the iron-zinc alloys presented a few years ago,[3] much new work has been published, some of which[5-16] was too late to be included in the recent edition (1939) of the American Society for Metals' Handbook.[4]

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FIGS. 1 and 2 are reproductions of the latest iron-zinc diagram proposed by Schramm[11] as a result of his investigations by microscopic, thermal, magnetic susceptibility and X-ray methods. Table I summarizes all the known published X-ray data of the phases present.

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THE solubility of iron in zinc has been determined by X-ray methods.[10] In the same manner the homogeneity range of the Γ phase was studied[10] using the principle that the parameter of an intermetallic compound changes while the concentration of one of the constituents changes.

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SCHRAMM[10] has found some 80 alpha lines in X-ray powder photograms of phase δ_1, and from these he believes that this phase is related to the Γ phase. Previous investigators had considered this δ_1 phase to be hexagonal close packed[17] with an axial ratio $c/a = 1.130$.[12] It is not a superstructure, but a gigantic cell containing 550 ± 8 atoms in the unit cell. This would make it the largest cell found to date among the intermetallic phases. More work seems to be desirable on the structure of the δ_1 phase.[24] The formula given is also uncertain. No X-ray work has been done on the structure of the high-temperature delta phase.

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ZETA,[8] a new phase with a narrow range of homogeneity (6.0 to 6.2 per cent Fe by weight) has been established by thermal, microscopic, magnetic susceptibility and X-ray methods. The crystal structure was claimed[10] to resemble that of the Γ phase, although having lower symmetry. Halla, Weil, and Goetzel's[16] data for this phase are given in Table 1. They established definitely that $FeZn_{13}$ is monoclinic. There are two molecules of $FeZn_{13}$ per unit cell.

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IT has been mentioned before that a phase designated as $FeZn_{10}$ was determined some time ago[1] by chemical analysis and found in large amounts in heat-treated zinc coatings. This phase was believed to correspond to the C phase found in galvanized wire coatings by X-ray diffraction.[2] A comparison of the Clark and Still-

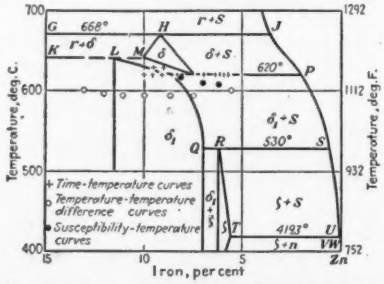

FIG. 2.—TRANSFORMATION OF δ IN δ_1 IN IRON AND ZINC SYSTEM.

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[1]References are at the end of the paper.

well data for C phase (7 lines) with that of Schramm[8] (52 lines) suggests the identity of this phase with $FeZn_{21}$. The first two investigators maintain that the new phase is body-centered cubic, and the German author believes that it is cubic of low symmetry.

✦ ✦ ✦

Table 2.—Analyses of Steel and of Coating

Sample	"Galvannealed" Sheet	Sample	"Galvannealed" Sheet
I. Analysis of base steel, per cent:		II. Weight of coating, oz. per sq. ft.	0.62
Carbon	0.02	III. Analysis of coating per cent:	
Manganese	0.40	Iron	10.02
Phosphorus	0.085	Lead	1.07
Sulphur	0.057	Tin	0.34
Silicon	Tr.	Zinc (by difference)	88.57
Copper	0.30		
Nickel	0.26		

Experimental Procedure

SAMPLES from a commercial galvanized sheet taken at random were submitted to X-ray diffraction analysis. The sheet was hot-dipped in a "double-bottom" galvanizing pot[25,26] and the coating was "galvannealed,"[1,27] a commercial process that consists in passing the freshly galvanized sheet through a muffle furnace at 1200°F. for approximately 15 sec. when traveling at 60 ft. per minute. The sample was dipped for one minute in a 1.7 per cent by volume solution of sulphuric acid to remove any superficial zinc oxide. After this treatment the weight of coating was 0.58 oz. per square foot of sheet. The analyses of the steel and of the coating are given in Table 2.

Table 3.—Diffraction Pattern of Heat-treated Zinc Coatings

Angles Calculated to Co-Kα_1 Radiation

Fe-$K\alpha_1$ Radiation Intensity	Co-$K\alpha_1$ Radiation Angle	d hkl A.	Source
			Zeta ($FeZn_{13}$)
	18° 20′	2.84	Zeta and Fe_5Zn_{21}
	20 36	2.53	Zeta and Fe_5Zn_{21}
Strong	23 57	2.197	Zeta
Medium	24 23	2.161	$FeZn_7$ and Fe_5Zn_{21}
Strong	24 43	2.134	Zeta and Fe_5Zn_{21}
Weak	25	2.112	Zinc (2.08)
Medium	25 17	2.09	Zeta
Very weak	25 33	2.07	Zeta
Weak	26 9	2.025	Iron (110) 2.01
Weak	26 40	1.988	
Very, very weak	27 42	1.922	Zeta Fe_5Zn_{21}
Very weak	27 46	1.915	
Very, very weak	28 18	1.880	Fe_5Zn_{21} Unidentified
Very, very weak	28 34	1.866	
Very, very weak	28 54	1.847	Zeta Zeta
Very weak	29 24	1.818	Zeta and Fe_5Zn_{21}
Weak	30 44	1.746	Zeta
Weak	32 3	1.682	$FeZn_7$ (1.67)
Weak	32 29	1.661	$FeZn_7$ (?) (1.626)
Weak	32 52	1.644	Zeta
Weak	34 26	1.578	
Very, very weak	36 19	1.506	$FeZn_7$ (1.518) Fe_5Zn_{21}
Weak	36 46	1.491	Fe (200) and Fe_5Zn_{21}
Strong	38 34	1.431	Zeta
Weak	39 14	1.411	Zeta and $FeZn_7$ (1.393)
Weak	40 10	1.383	Zeta
Very weak	41 9	1.356	Zeta
Weak	42 33	1.320	Fe_5Zn_{21}
Weak	42 57	1.310	
Very, very weak	43 21	1.300	Fe_5Zn_{21} Zeta and $FeZn_7$ (1.274)
Medium	44 17	1.278	Zeta and $FeZn_7$ (1.25)
Weak	44 50	1.266	Fe_5Zn_{21} (1.213)
Weak	46 33	1.229	Zeta, Fe_5Zn_{21}, and $FeZn_7$ (1.217)
Very weak	47 6	1.218	
			Fe (211) 1.166
Medium	50	1.165	Zeta
Very weak	56 58	1.064	Zeta and Fe_5Zn_{21}
Very weak	57 34	1.057	Fe (220) 1.01
Medium	62 2	1.010	

*The wire readings had to be corrected to take into consideration the fact that the diffraction occurs from several points on the surface.[2]

TABLE 1.—*Phases in the Zinc-iron System*

Greek Letter	Phases	Formula, Per Cent Fe: X-ray Data	Atomic	Wt.	Crystal Structure	Space Group	Atoms Elementary Cell	Parameter, A.	Remarks
Alpha..	α Fe	FeZn			b.c.c.	O_h^9	2	2.862–2.943	Up to 400°C. dissolves 6 per cent Zn
Gamma	γ Fe	FeZn			f.c.c.	O_h^5	4	Not determined	May dissolve as much as 43 per cent Zn
Capital Gamma.	Γ	Fe_5Zn_{21}[a]	23.2 31.3	20.5 28	b.c.c.	T_d^3	52	8.9560–8.9997	[10]
	δ_1	$FeZn_7$ (?)	8.1 13.2	7– 11.5	Hexagonal	$C_{6v}^4 = C_{6mc}$ or $D_{6h}^4 = C_{6mmc}$	550 ± 8	a — 12.80 c — 57.6 c/a — 1.1300 [12]	Present between room temp. and 640°C. [10]
Delta.	δ	$FeZn_7$ (?)	8 1 11.5	7– 10				Not determined	620–668°C.
Zeta..	ζ	$FeZn_{13}$	7.2 7 4	6 0 6 2	Monoclinic	$C_{2h}^3 - C_{2/m}$	28	a — 13.65 b — 7.61 β — 128°44′ c — 5.06	There are two molecules to the unit cell. [16]
Eta....	η	Zn		Max. 0.003	Hexagonal c.p.	D_{6h}^4	2	a — 2.6600 b — 4 9379 c/a — 1 8563	[4a]

[a] The Γ phase occasionally has been given the formulas $FeZn_3$, Fe_3Zn_{10}[5,16] and Fe_4Zn_{21}.[18,19] This last formula is to be preferred although it is not consistent with any regular distribution of the two kinds of metal ions between the points of the basic alpha-brass structure,[20] whose characteristic is the ratio of 21 electrons to 13 atoms. W. L. Bragg[21] has stated that the relation between number of electrons and atoms in the structural unit overrides the influence of regular arrangement. Jones,[22] using the reasoning of wave mechanics, has made a study of the energies of the loosely bound electrons in the alloys with the structure and found that the ratio of 21:13 comes very near to completely filling a zone. The magnetic properties are found to agree with such an arrangement. Thus, although the actual amounts of iron and zinc may not correspond to the relationship Fe_4Zn_{21}, it has the characteristic arrangement of atomic sites on which the conception of a phase is formed. In other words, Hume Rothery's rule[20] and Jones' theory,[22] although indicating a definite number of atoms in the unit pattern, make no demand that the ratio of the atoms of different kinds should be represented by simple integers.[23]

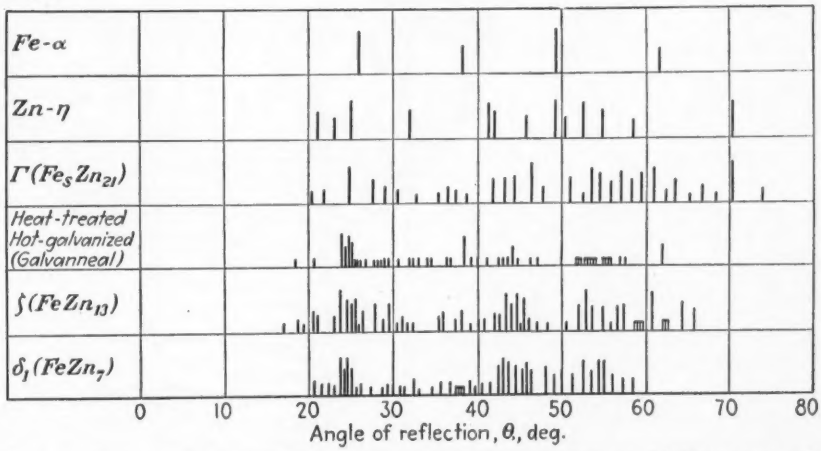

FIG. 3.—COMPARISON OF COMPOSITE X-RAY DIFFRACTION PATTERN OF HEAT-TREATED HOT-GALVANIZED COATING AND PATTERNS OF KNOWN IRON-ZINC ALLOYS.

X-ray Diffraction Analysis

THE X-ray diffraction pictures were taken by allowing collimated unfiltered radiation to fall on the sheet sample at a glancing angle with its surface. The diffraction pattern was obtained on a film located on a cylindrical camera placed about the sample. The diameter of the camera used

(*Please turn to Page 350*)

Sleeper & Hartley INC.

Worcester, Mass., U.S.A.

The Nozzle-swirl Process

By C. A. Piercy
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Schenectady, New York

Applies oxide-free lead sheathing to insulated cables — A noteworthy achievement in cable manufacture. ✦ ✦ ✦

THE main objectives in the nozzle-swirl process of lead sheathing insulated cable have been the prevention and elimination of all oxidation impurities and the production of a sheath of uniform quality and thickness throughout the length of the cable. Essential factors in obtaining these results are the avoidance of exposure of the hot lead to air throughout the process and the development of methods of mechanically removing oxide formations from the lead during the charging of the cylinder of the lead press.

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THE methods that have proved most effective in achieving these end results have been incorporated in a process (Fig. 1) characterized by the following features:

(a) Pure lead from supply source
(b) Hydrogen-flame atmosphere
(c) Bottom filling
(d) Nozzle swirl
(e) Flood ring and skimming
(f) Three-compartment melting pot with inert-gas atmosphere
(g) New and better die block
(h) Accurate, automatic control and recording of pressures and temperatures.

✦ ✦ ✦

THE over-all result of this combination of factors is a lead sheath of a high degree of uniformity and entirely free of flow lines, laminations, defective die welds, or other evidence of oxides.

✦ ✦ ✦

The Nozzle-swirl Process

IN the development of the process, all the tests and experiments that were made indicated that the incoming molten lead had to melt the entire surface of the old, or solidified, charge of lead in the cylinder of the sheathing press in order to remove the film of oxides completely. Also after these oxides had been freed, it was necessary to keep them away from the walls of the cylinder.

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TO accomplish the purpose of assuring that the molten lead forced into the sheath is free of these oxides and impurities, use is made of bottom filling, and the filling spout is terminated in a nozzle (Fig. 2) with vanes that impart a swirling motion to the stream of lead. This nozzle is so designed that, through the resulting centripetal action, the oxides rising to the surface are made to congregate near the center of the surface of the new charge of molten lead. At the same time this nozzle gives immediately a complete coverage and a washing or scrubbing action on the surface of the old charge of lead as shown in Fig. 3. The molten lead is swirled from the vanes at *A*, *B*, *C*, and *D* and the old charge directly under the nozzle is melted by the lead from the center tapered hole *E* in the nozzle. By the automatic regulation of inert-gas pressure on the supply lead pot, this nozzle gives a controlled swirling action to the molten lead, thus forcing the lighter impurities to collect on the surface and in the center of the new charge of molten lead. These impurities are removed from the charge by overflowing 150 lb. of lead into a flood ring on top of the cylinder. The swirling action continues during the whole charging operation. As the swirling molten

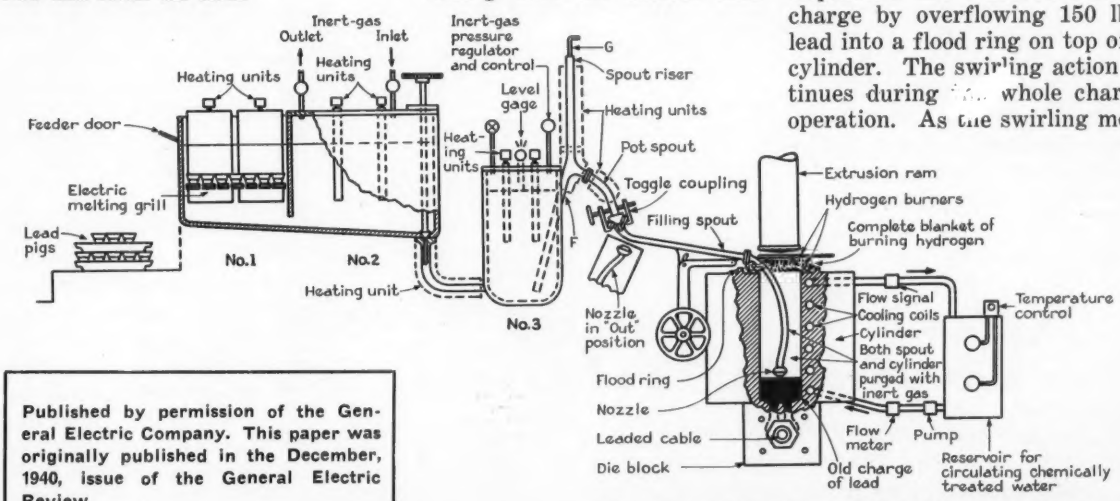

Fig. 1. The complete chain of co-ordinated lead-press equipment for the nozzle-swirl process.

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lead rises in the cylinder (Fig. 4) it melts the lead shim remaining on the cylinder wall from the previous stroke of the ram and at the same time carries the lighter impurities to the top center where they are finally removed by skimming and by the flood ring.

✦ ✦ ✦

THIS action keeps the lead swirling just enough to pull the surface oxides to the center and hold them there. This is accomplished by gradually increasing the nitrogen pressure in lead compartment No. 3 (Fig. 1). The nozzle remains in position during the entire filling of the cylinder.

✦ ✦ ✦

DURING this filling operation the top of the lead cylinder is blanketed with burning hydrogen that is fed from a ring around the edge of the cylinder and from a large pan burner over the cylinder. In addition to blanketing the entire cylinder opening, the burning gas shoots downward thereby preventing further oxidation of the molten lead.

✦ ✦ ✦

TO assist in removing the oxides and to decrease the amount of oxide on the surface of the new charge of lead, the flood ring shown in Fig. 5 was developed for the top of the cylinder to facilitate removal of the solidified lead disk. Three tapered spokes are built on the ring at 120 deg. These spokes or separators cut the solidified disk of lead into three sections, which are shoved up by the thin walls of lead formed by the "packing" operation. Thus, the operator can easily remove these segments during the cooling period required for the new molten lead to solidify.

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THE flood ring allows the ram (Fig. 6) to enter the cylinder when the cylinder is completely sealed from the air with the clean molten lead. It also gives an automatic cropping action to

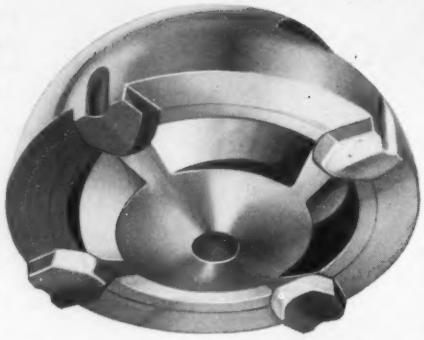

Fig. 2. The nozzle used in the nozzle-swirl process.

the new charge of lead as it rises and overflows into the flood ring.

✦ ✦ ✦

THE end surface of the extruding ram has a slight taper;

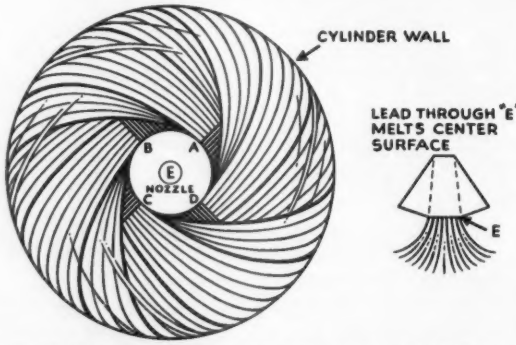

Fig. 3. Diagram showing a plan view of the swirling action caused by the vanes at A, B, C, and D and opening E of the nozzle shown in Fig. 2.

✦ ✦ ✦ ✦

that is, the center is lower than the edge. This gives an outward flushing to the molten lead as the ram starts to enter the cylinder to "pack" the new charge of lead. This action is shown in Fig. 6.

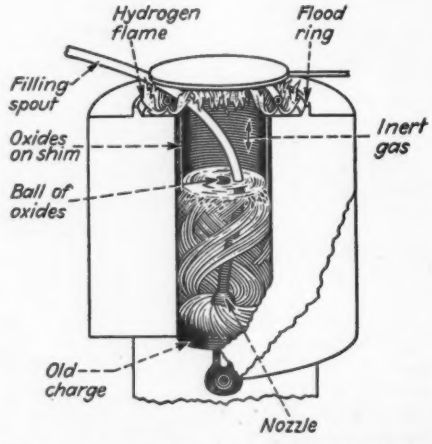

Fig. 4. A vertical section of lead-press cylinder, showing swirl imparted to molten lead to free it of oxides and impurities.

✦ ✦ ✦ ✦

Thus no oxides are left on the top of the new charge of lead remaining in the cylinder and the ram is sealed in clean, pure lead.

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A NEW type of die block is used in order to further improve the quality of the lead sheath as to uniformity of thickness. Because of the large size of the orifices through which the lead passes, the concentricity is improved and the average thickness is more uniform from the start to the end of a charge of lead.

✦ ✦ ✦

Control of Cooling

THERE is an optimum temperature for extruding lead, and each charge must be extruded at this temperature.

✦ ✦ ✦

AFTER the lead cylinder is charged with molten lead, the lead must be cooled to the "pressing" temperature; and in order to accomplish this, it is desirable to have a constant rate of heat transfer from the molten lead to the cooling coils embedded in the lead-press cylinder.

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IN the leading process described here, this control of cooling is done automatically by a water reservoir which circulates a constant quantity of water at uniform temperatures through the cylinder, as shown in Fig. 1. The water is treated with chemicals so that the surface of the cooling chamber in the lead cylinder will not corrode, thus maintaining a constant medium for heat transfer from the new charge of lead to the circulating water.

✦ ✦ ✦

Completely Balanced System

THE several elements which have been described function as the final stages in the completely co-ordinated process shown in Fig. 1. The remaining features of the over-all sheathing operation may now be summarized.

✦ ✦ ✦

COMPARTMENT No. 1 is open to the atmosphere and

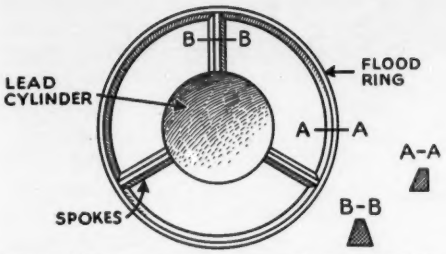


Fig. 5. New type of flood ring, with tapered spokes, used in nozzle-swirl process.

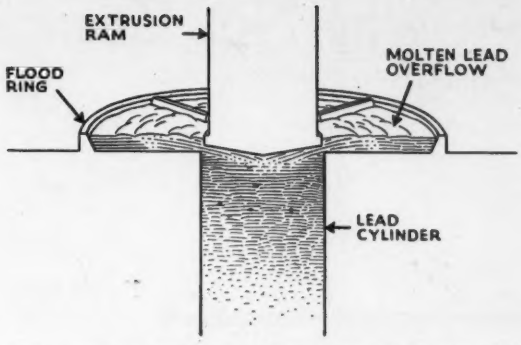
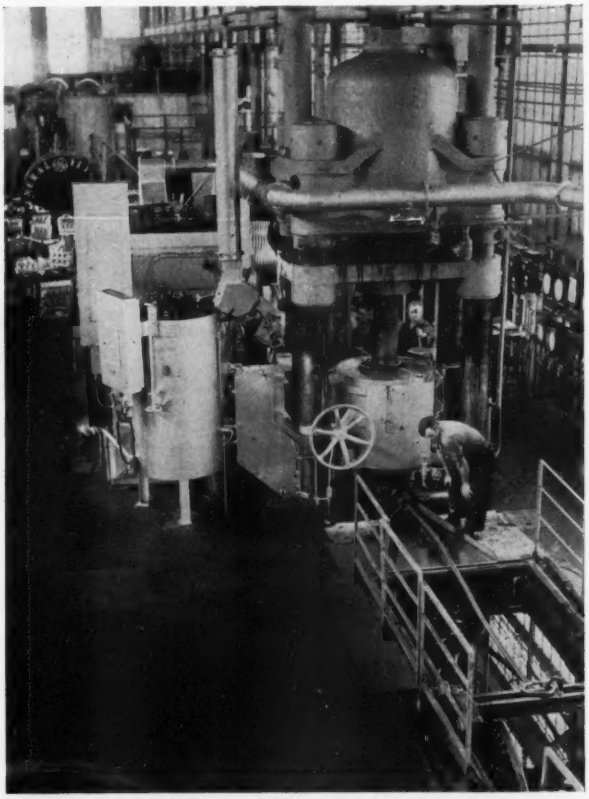


Fig. 6. Diagram showing the flushing action of the tapered face of the ram in the cylinder of lead press.

contains electric melting units and also a perforated melting grill on which the pigs of lead are placed. This grill is located about six inches from the bottom of the pot, thus assisting any oxides or dross from the incoming lead pigs to rise to the surface before the molten lead is passed on to the next compartment. Practically all the impurities and oxides rise to the surface in compartment No. 1, before the lead enters compartment No. 2.

✦ ✦ ✦

THE molten lead passes from No. 1, through an opening in the bottom of the partition, into sealed compartment No. 2, which is also heated by immersion electric units. Here the lead is protected by a nonoxidizing gas. A large volume of lead is maintained in compartment No. 2, allowing ample time for any remaining oxides or dross which remain to rise to the surface, thus insuring a flow of clean lead to compartment No. 3, which is thermally isolated and also protected by a nonoxidizing gas. Immersion-type heating units are used in compartment No. 3. By increasing the gas pressure in No. 3, the molten lead is forced up through *F* into the bottom-filling spout. The total amount of lead in this type of lead pot is 22,000 lb. (operating capacity)—about three times the amount formerly handled in the one-compartment lead pot.



Hydraulic Press for Sheathing Cable—1941 Style. This huge apparatus is used for sheathing paper-insulated cable with lead by the "nozzle swirl" process at the Schenectady Works of General Electric. The process, developed by G. E., produces a metallurgically perfect sheath by removing oxides which form when lead is molten and has its greatest affinity for oxygen. This is accomplished through centripetal action produced by a patented nozzle which swirls the molten lead during the filling operation. The result is a sheath that is free from entrapped oxides and resultant areas of weakness. In the foreground, the paper-insulated cable is shown emerging from its oil bath and entering the press. Sheathed in its protective armor of lead, it leaves the press on the opposite side, where it is wound on large reels.

WITH this new lead pot and the bottom-filling equipment, the lead does not come in contact with air from the time it leaves compartment No. 1 until it comes from the die block in the form of the finished lead sheath around the cable. The lead going into the lead-press is clean, free from lead oxides and impurities, and at a constant temperature, thus helping to produce a high-quality lead sheath.

✦ ✦ ✦

THE pot spout from compartment No. 3 down to the toggle coupling is kept full of nitrogen, thus preventing the formation of lead oxides on the surface of the molten lead in the pot spout of *F*. This is accomplished by extending the pot spout up into the heated spout riser, which is supplied with nitrogen under pressure from the supply line *G*. Another important feature of the spout riser is that the filling spout and cylinder are purged with an inert gas as soon as the filling spout is connected to the pot spout. By this action, the molten lead is further protected from any oxidizing agent. The cycle is thus completed with no air contacting the lead from the solid lead pig in compartment No. 1 to the lead that is formed around the cable as lead sheath.

✦ ✦ ✦

Excellence of Product

BESIDES the uniformity of the cable sheath produced by the process, and its freedom from oxide, which have been mentioned, the absence of blisters is noteworthy. In more than two years

(*Please turn to Page 363*)

Why Not Change Tool Holders Instead of Tools?

By J. R. Longwell
Chief Engineer, Carboloy Company, Inc.,
Detroit, Michigan

A suggestion for eliminating wasted set-up time. ✦ ✦

AT a time when all efforts are being directed at increasing output per machine and per hour, one simple possibility seems to have been largely neglected: the time-wastage involved in changing tools on machines.

✦ ✦ ✦

THE tool holder has always been a sort of illegitimate child. It has in most cases been the prime responsibility of neither the machine tool builder nor the machine tool user. This is particularly true in connection with holders for machines on which turning, facing and boring operations, etc., are performed.

✦ ✦ ✦

WITH the advent of higher speed machinery permitting greater outputs, set-up time has become more important than previously since even the same amount of time lost means a greater percentage of reduction in machine productivity.

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THE wider-scale use of carbide tools with their longer life between grinds has served to offset the total time loss to a considerable extent, but time for individual change-overs remains the same — if not more—since today we are working to greater accuracies, requiring more accurate tool adjustment.

✦ ✦ ✦

AGAIN, with a higher and higher proportion of relatively unskilled men operating our machines, less and less of actual tool setting is being performed by the machine operator. He just stands around and waits while the tooling is being adjusted. Since there is no superfluity of good tool setters either — their number hasn't increased in proportion to industrial output — the machine operator frequently has to wait until the tool-setter can get around to his machine.

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FUNDAMENTALLY, the ideal approach to the problem would be the elimination of all tool adjustments at the machine. It is doubted whether such an approach is feasible except in rare instances. However it is possible to vastly reduce the amount of time lost in changing tools, by transferring all major adjustments to the tool room itself.

✦ ✦ ✦

THIS can be done by the simple expedient of changing tool holders instead of tools on the machines. Major adjustments can then be made in the tool room leaving only minor 'touch-up' adjustments at the machine for the tool setter.

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WITH the broader usage of cemented carbide tooling this method of handling the problem has automatically become quite simple, since grinding of such tools is already being centralized in the tool room in most plants.

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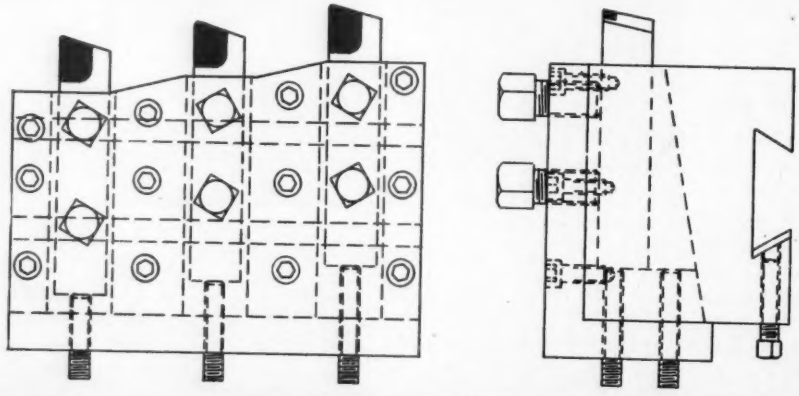
SURPRISINGLY enough little thought has been given this subject by industry in general, probably because the vast majority of machines are not equipped with quick-interchangeable holders. Such holders, however, require no great ingenuity to design, and are relatively inexpensive to make, while tool holder mounting plates on machines can also be modified in a simple manner to enable their use.

✦ ✦ ✦

FIG. 1 for instance shows a suggestion for a simple type of quick replaceable tool holder for multiple-point tooling set-ups. Such a tool holder may be attached in the conventional manner to the standard tool holder mounting plate on the machine.

FIGURE 1



✦ ✦ ✦

IT will be noted from the drawing that

the necessity of using shims to adjust the tool to cutting height is eliminated through employment of a screw-adjusted wedge. The tool is raised to the correct height with this wedge, and is then clamped tight with the set-screws shown. This permits adjusting for in-and-out position of the tool on the machine as well as in the tool room.

✦ ✦ ✦

WHERE only one or two holders are used on a machine, either one can be unclamped and slid off the end of the dovetail without interfering with the other. If a larger number of holders is required, then there is a practical difficulty in that, to remove the holders in the center, tool-holders at the ends have to be removed first.

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THIS difficulty may be overcome by a slightly different type of tool holder as suggested in Fig. 2. Although for this type of holder a special mounting plate is required on the machine, the mounting plate itself is simple and low in cost to construct and install. The holder is then located by means of the V-groove in the special mounting plate.

✦ ✦ ✦

THE tool holder here is quite similar to that shown in Fig. 1 as far as locating the tools is concerned. Again, the wedge type of construction is employed to adjust for height of tool, while a second adjusting screw locates the tool for in-and-out position. As shown, the tool holder is clamped through the center, resulting in a necessarily wider spacing of tools than may be desired. In such a case the use of two holders side by side, permits locating tools just as close together as may be needed.

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IN both of these holders, tools can be set to cutting diameter and center height in the tool room, immediately following grinding. This may be most easily accomplished through the use of simple gages, such as is suggested in Fig. 3 for setting a tool to correct cutting diameter in a boring quill.

✦ ✦ ✦

THE gage consists essentially of a dial indicator mounted on a light aluminum holder in which is incorporated a V-block. To eliminate chance of error due to wear in this block, small hardened steel inserts are provided at the contact points for the quill.

✦ ✦ ✦

THE dial indicator is set to zero through the use of a simple "master gage." The light gage is then stamped on the boring bar or grill and the tool is set to cor-

(*Please turn to Page 360*)

FIGURE 2

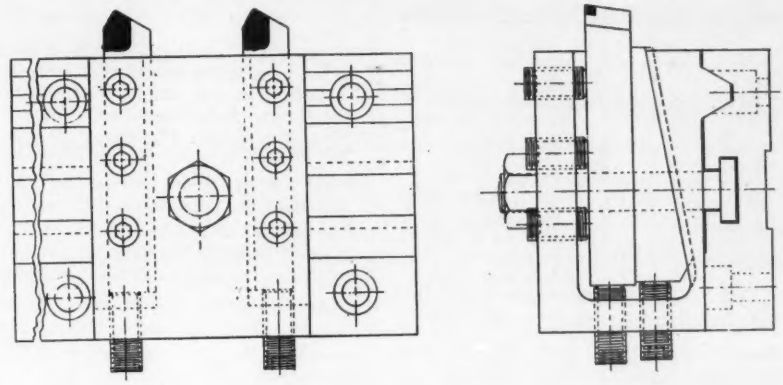


FIGURE 3

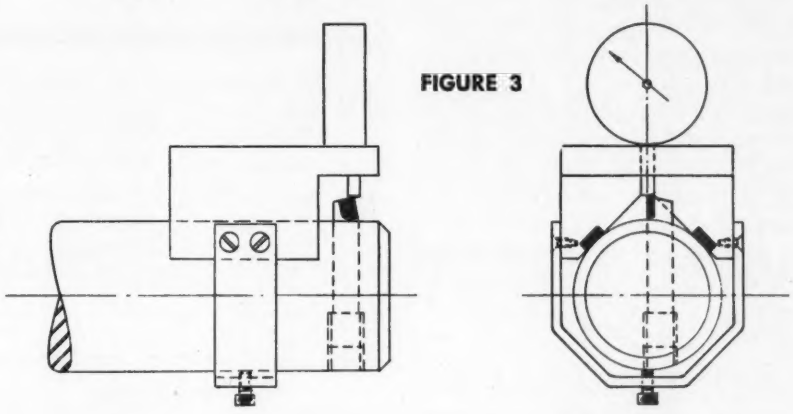


FIGURE 4

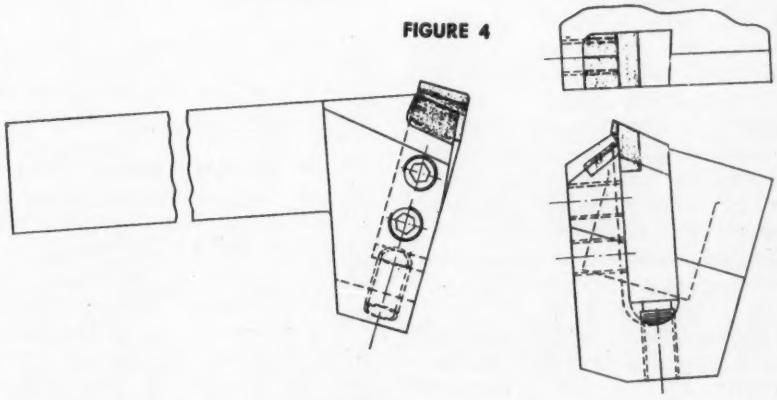
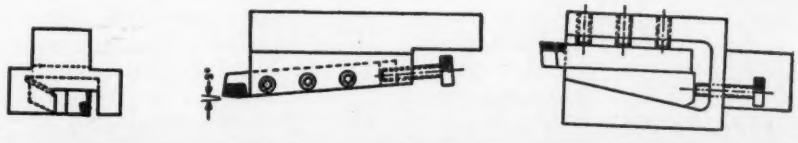


FIGURE 5



Defense Contract Service Appeals To Every American Manufacturer

"This is an all-out effort— nothing short of all-out effort will win."—Franklin D. Roosevelt, March 15, 1941.

"Nothing short of the practical limit of our available productive capacity is sufficient for the defense job we have now undertaken."—William S. Knudsen, March 17, 1941.

This is an article on the defense contract service. This service has been organized to harness the full productive power of America to total defense. Through 36 field offices it is recruiting every suitable factory, large and small, in the land. Every manufacturer will serve his country and himself by making full use of this service. ✦ ✦ ✦ ✦

IN June 1940, as the vaunted army of the French Republic was crumbling before the onslaught of mechanized aggressors, the greatest industrial nation on earth began in earnest the grim task of building an unbeatable military machine.

✦ ✦ ✦

SINCE that time the task has grown even greater — has in fact become the task of creating in this country "the arsenal of democracy."

✦ ✦ ✦

TOWARD this great goal our country started almost from scratch. Munitions plants, built in the turmoil of the World War, had been pulled down, stripped of equipment or converted to new uses as the United States gladly turned, following the Armistice, to the task of beating a swiftly-forged industrial sword into the machinery of peace.

✦ ✦ ✦

Switching From Peace to War Needs

FOR more than 20 years the Nation concentrated its energies and genius for mass production upon the output of automobiles, ice boxes, radios, and a thousand and one other useful peacetime products—the fruit of a free and vigorous democracy. Our facilities for making munitions dwindled to an insignificant level.

✦ ✦ ✦

THE fall of France was the signal for Congress to appropriate billions for rearmament. Swiftly, the Army and Navy placed huge orders. Of necessity, most of them went to large firms that had the managerial, engineering, and factory personnel to translate orders of such type and magnitude into terms of plant facilities, manpower, and materials.

NOW every suitable factory in the country—large and small must be enlisted. Only that way can we make more weapons NOW for the defenders of democracy. It is the only way to get out the additional orders that are in the making. They must be filled in record time.

✦ ✦ ✦

How You Can Help the Defense Contract Service

THOUSANDS of manufacturers whose useful machines are now idle or could be made available are asking what they should do to help. The answer is this: Write or go to the regional office of the **Defense Contract Service** at the Federal Reserve Bank or branch bank which serves the region in which you live.

✦ ✦ ✦

THE **Defense Contract Service** has been set up by the Office of Production Management, with the cooperation of the Federal Reserve System, to help democracy work swiftly.

✦ ✦ ✦

IT provides a clearing house of information—close to home—for prospective contractors and subcontractors, for Army and Navy procurement officers in the field, and for firms that now hold defense contracts and need subcontractors to help them speed up deliveries.

✦ ✦ ✦

THESE are its objectives:

1. **To establish a chain of conveniently located offices throughout the Nation where a contractor or potential contractor can receive all the information he could get from a trip to Washington.**
2. **To advise manufacturers how to get contracts for defense work they are equipped to do.**
3. **To encourage prime contractors to sub-contract the greatest possible amount of their work.**
4. **To help small shop owners pool their facilities so they can jointly participate in defense work which none of them is equipped to handle individually.**
5. **To see that any manufacturer who has suitable facilities and is otherwise qualified for defense work obtains the necessary financing.**

✦ ✦ ✦

Where to Make Inquiry

THERE are 36 regional offices of the Defense Contract Service—one in each of the 12 Federal Reserve Banks and their 24 branch banks. With only one exception, there is one within 250 miles of every industrialist in the United States.

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THESE regional offices are headed by production-minded business men. Their staffs include technical men competent to advise on the use and adaptability of plant facilties for defense work.

✦ ✦ ✦

SENIOR officers of the Federal Reserve Banks and branch banks are available to advise on financial problems. Staff members are there to explain the provisions of Government contracts.

✦ ✦ ✦

FIVE great professional engineering societies are cooperating with the Service. Through them, technical advisors are available to the regional offices

for consultation on special engineering problems—civil, electrical mining, mechanical, or chemical.

✦ ✦ ✦

Nature of the Contract Service

THE Defense Contract Service officers do not take the place of the Army and Navy procurement officers who have been maintained in the field for many years. Their purpose is to help the armed services by sending more qualified bidders to them and seeing that their requirements are known to business men throughout the land.

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EVERY regional office of the Defense Contract Service has lists of articles that the Army and Navy want to buy. Blueprints and, in some instances, samples of these items are on hand.

✦ ✦ ✦

MANY manufacturers have machines and skilled men to handle defense jobs, but do not know how to go about getting a contract. The Army and Navy would be glad to use their facilities if they knew about them; so, in many instances, would prime contractors.

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REGIONAL offices will help bring these groups together by expanding, correlating, and analyzing the many valuable plant facility surveys which already have been made by various public and private organizations.

✦ ✦ ✦

THE results of these surveys, plus information obtained from manufacturers who visit the regional offices, will provide a catalog of the productive facilities in every region of the country. By consulting this catalog, the Service will be able to direct Army and Navy purchasing officers to the plants they need, prime contractors to plants capable of handling subcontracts for them, and prospective subcontractors to prime contractors who have work they could do.

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THESE catalogs of industrial facilities may also serve as the basis for organizing small manufacturers who, by pooling their limited facilities, can handle defense work.

Aim to Spread Defense Orders Wisely

THE Service will not assume responsibility for negotiations between primary and subcontractors. But wherever subcontracting will hasten deliveries, it will suggest to prime contractors what part of their work subcontractors can do—and urge them to farm out this work.

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LISTS of defense contracts already let are maintained at each regional office. These lists are brought up to date daily by dispatches from Washington. They enable the Service to tell potential subcontractors what firms have work they might share.

✦ ✦ ✦

THE Service also maintains at its regional offices a list of regular bidders for defense orders. This enables potential subcontractors to approach prospective prime contractors and figure on part of their work before they submit their bids.

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THE Office of Production Management believes that the spreading of defense work as widely as possible among the existing plants is the best possible way to speed up immediate deliveries and to increase total production.

✦ ✦ ✦

FURTHERMORE, it believes this the best way in which greater concentrations of industry, complicating the problem of economic re-adjustment when the emergency ends, may be held to a minimum.

✦ ✦ ✦

MANUFACTURERS should provide essential information when they write or go to a Defense Contract Service office. They should send or take with them photographs of the interiors of their shops, taken from several angles, and pictures or descriptions of products they are now making or have made in the past. In addition, they should give the answers to as many as possible of these questions:

How many employees do you have?

How many people could you employ on a one-shift basis, a two-shift, or a three-shift basis?

How many shifts are now working in your plant, and what is the length of each shift?

How many shifts can you work with the labor supply available in your community?

Do you have a design and development department?

List each of your machines, by size, type, manufacturer's name, manufacturer's serial number, the year in which the machine was built, and the tolerances to which it will work.

How many machine-hours do you have idle per week, over and above present commitments? (This information should be broken down by types of machines.)

Is your power source adequate?

What are your shipping facilities?

Who are some of your regular customers?

Have you ever had a defense order and, if so, for what?

Have you ever been a subcontractor and, if so, for whom?

Have you ever subcontracted any of your work and, if so, to whom?

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May Inspect Factories

WHEN necessary to find plants for specific purposes, the Defense Contract Service will send skilled production men, experienced in machine shops and manufacturing establishments, to inspect factories and consult with their owners.

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THE Service is decentralized to put the Office of Production Management in closer touch with the productive facilities of the Nation. But an organization is maintained at Washington to supervise and coordinate the entire program.

✦ ✦ ✦

ROBERT L. MEHORNAY, of Kansas City, is Chief of the Service. Assisting him is a headquarters staff divided into these six sections:

✦ ✦ ✦

PROCUREMENT Section, headed by **C. J. Myers** of Oklahoma City, whose main function is to channel to the field offices complete information on where, when, and how to bid on Army and Navy contracts.

✦ ✦ ✦

FINANCIAL Section, headed by **Charles S. Garland,** of Baltimore, which supplies to the regional offices complete information on financial matters connected with emergency plant construction and with prime and subcon-

(*Please turn to Page 364*)

Outstanding Personalities of the Wire Industry

W. W. Holloway, Chairman, A. J. McFarland, President, Wheeling Steel Corporation

SUCCEEDING the late Alexander Glass, **William W. Holloway,** president of Wheeling Steel Corporation, has been elected Chairman and **Archie J. McFarland,** executive vice president, has been elected president.

✦ ✦ ✦

TO fill vacancies caused by the death of Mr. Glass, **Arthur C. Stifel,** a director, was elected to the executive committee and **L. Woodward Franzheim,** vice president and treasurer has been made a director.

✦ ✦ ✦

MR. Holloway has been engaged in the steel industry all his business life, having started with La Belle Iron Works in 1909. He has been president of Wheeling since 1930. Mr. Holloway is a director of the American Iron & Steel Institute, the Fostoria Glass Company, and the Hazel-Atlas Glass Company and is president of the Bridgeport National Bank of Bridgeport, Ohio.

✦ ✦ ✦

MR. McFarland has been with Wheeling Steel or its predecessor companies since 1905, with exception of a period of five years when he was an executive of Follansbee Brothers Company. He has been first vice president of Wheeling Steel since 1931 and executive vice president since 1937. Mr. McFarland is a director of the Wheeling Dollar Savings & Trust Company.

✦ ✦ ✦

W. H. Marsh, Treasurer, Canada Wire & Cable Company, Ltd.

THE additional duties of treasurer of the Canada Wire & Cable Company, Ltd., have been assumed by **W. H. Marsh,** vice-president of the Company. Mr. Marsh, who formerly held the position of treasurer until about two years ago, succeeds **J. E. McCallum,** who has resigned from the Company. At the annual meeting of the company, **A. R. Winnett** was appointed assistant treasurer.

George H. Faux, Asst. Secretary, National Oil Products Company

THE appointment of **George H. Faux** as assistant secretary of the National Oil Products Company of Harrison, New Jersey, was recently announced by **Charles P. Gulick,** president and chairman of the board. Mr. Faux has been in charge of the credit department for the past 14 years.

✦ ✦ ✦

UNDER his new appointment, Mr. Faux will supervise the accounting and cost departments in addition to remaining in charge of the credit department.

✦ ✦ ✦

BEFORE coming to National Oil Products Company, Mr. Faux had been chief accountant and office manager with a fire insurance firm in New York.

✦ ✦ ✦

IN his new capacity, which is a newly-created post in the firm, Mr. Faux will serve directly under **Albert A. Vetter,** secretary.

✦ ✦ ✦

Robert T. Bowman, Director, Public Relations, John Roebling's Sons Co.

THE appointment of **Robert T. Bowman** as director of public relations was recently announced by John A. Roebling's Sons Company, Trenton, N. J. Mr. Bowman resigned as president of the New Jersey State Chamber of Commerce, which position he held for three years.

✦ ✦ ✦

William H. Lynn, Export Sales Manager, Wickwire Spencer Steel Company

ANNOUNCEMENT was recently made of the appointment of **William H. Lynn** as export sales manager, Wickwire Spencer Steel Company, New York. Mr. Lynn joined Wickwire two years ago, after having spent six years as general manager of the Meddo Steamship Corp. He was, at one time, employed in the shipping and purchasing departments of International Railways of Central America.

Walter L. Brown, Vice President Western Electric Company

ACCORDING to an announcement recently made by **C. G. Stoll,** President of the Western Electric Company, **Walter L. Brown** of Huntingdon, West Virginia, has been appointed vice president and general counsel of the Company. He succeeds **T. Brooke Price,** who becomes general attorney of the American Telephone and Telegraph Company.

✦ ✦ ✦

MR. BROWN is a 1926 graduate of the University of Virginia with degrees in Science and Laws. A Rhodes Scholar, he attended Oxford University, returning from England with a B. A. degree. Since 1928 Mr. Brown has been practicing law as a member of the firm of Fitzpatrick, Brown and Davis, which has acted as attorney for the Chesapeake and Potomac Telephone Company. Since June of last year Mr. Brown has been vice president of Henry L. Doherty & Company, a position he has now resigned. Mr. Brown also succeeds Mr. Price as general counsel for Electrical Research Products, Inc., and other Western Electric subsidiaries.

✦ ✦ ✦

American Steel & Wire Announces Changes in Operating Department

A NUMBER of important changes in the Operating Department of the American Steel and Wire Company, subsidiary of the U. S. Steel Corporation, have been announced affecting the company's operations in Waukegan and Joliet, Illinois, Cleveland, and Worcester, Massachusetts.

✦ ✦ ✦

G. H. BENDELL, who has been Superintendent at Waukegan Works, has been transferred to Joliet as Assistant General Superintendent of Joliet operations. **S. R. Snow,** formerly Assistant Superintendent at Waukegan, has been appointed General Superintendent. Mr. Snow's place is taken

(*Please turn to Page 347*)

Wire Association Questions and Answers

THE Emergency Advisory Committee of the Wire Association has been functioning in many different ways in the industry assisting companies in processes, etc., and among the recent inquiries received is one which will be of wide interest and is published herewith for the benefit of the industry as a whole.

✦ ✦ ✦

Question No. 6000

Please advise us regarding the drawing of manganese-moly steel for 30 and 50 caliber cores for armor piercing bullets.

The material has the following analysis:

C—.60-.70	**Sul—.025 max.**
Mn—.75-1.00	**Moly—.80-.90**
Si—.25-.35	**Chrome—.10 max.**
Phos—.025 max.	

There are two sizes; 17/64″ (.2656) and 29/64″ (.4531), and when drawn must be finished plus or minus .002″. The wire is then cut and straightened after drawing. Material as finished drawn must be free from scale and rods UNIFORMLY ANNEALED so they will machine without difficulty on automatic machines.

a. In your opinion could this stock be drawn one hole from the rod to above sizes?

b. Would such drawing (one hole) disturb the annealing?

c. What speeds should be used?

d. What sizes of dies are necessary?"

✦ ✦ ✦

Answer No. 1

"(1). Unquestionably, drawing one hole will disturb the annealing.

(2). Speed should be ascertained by experimenting, but I would suggest that it should not exceed 200 F.P.M.

(3). Size of the dies to use obviously is determined by the finished size desired, namely, .2656 and .4531 and tolerances of plus or minus .002 seem reasonable.

(4). Although your inquiry does not ask for this suggestion and neither do I have much information to think about, but my thought is that this straightened and cut wire should be processed through to finished dimensions and then bright annealed with atmospheric temperature control to anneal with a bright finish previous to being fed to the automatic machines for making 30 to 50 caliber cores."

✦ ✦ ✦

Answer No. 2

"THE .265″ wire should be drawn from 5/16″ rods to .275″ wire. The .275″ wire should be spheroidized annealed in a controlled atmosphere preferably Drycolene gas. The annealed wire should be cleaned, coated with a medium lime coat and drawn through a 50-50 mixture of lime and metallic soap to the desired size.

The .453″ wire should be drawn from ½″ rods to .463″ wire. The .463″ wire should be spheroidized annealed in a controlled atmosphere preferably Drycolene gas. The annealed wire should be cleaned, coated with a medium lime and drawn through a 50-50 mixture of lime and metallic soap to the desired size.

This wire could be drawn at 45 RPM on 27 inch blocks with preferably 16° angle dies."

The Wire Association is for the specific purpose of improving production methods. It was organized as a clearing house of ideas on technical problems and research work in all phases of practical wire drawing and wire working.

The inquiries discussed were received from and answered by members of the Wire Association. These inquiries are sent to the Secretary of the Association who acts as a central clearing point, and neither the names of the firms or individuals sending in the inquiry, or of the men or firms replying are divulged without permission.

✦ ✦ ✦

Answer No. 3

"(1). **Material**
Use "normalized" rods of the analysis given. Avoid rust-pitted and seamy rods.

(2). **Pickling, Liming and Baking**
Pickle rods in sulphuric acid pickling (5% by volume of 66 deg. Be. acid) solution, heated to 120 deg. to 130 deg. F, and containing sufficient inhibitor, to avoid pitted surface. Rinse in cold water finishing with stream from high pressure hose. Dip in lime bath (15% by weight) at 180 deg. to 200 deg. F. Bake at 350 deg. F. for one (1) hour.

(3). **Drawing Practice (With bright drawing grease)**

Finished Wire Size	No. Drafts	From Starting Rod Size
.453″	1	31/64″
.2656″	1	19/64″
Block Diam.	**Max. Drawing Speed F. P. M.**	**Estimated H. P. Required**
26″	100	50
″	300	50

(4). **Die Sizes**
For single draft work, the dies should be sized to .004″ smaller than nominal finished wire size—to obtain maximum wearing life in dies (.004″ total permissible die wear), and to allow for swelling in straightening machine."

✦ ✦ ✦

Answer No. 4

"WE have had no experience in drawing the analysis of steel outlined in your letter for armor piercing bullets. The carbon is high, and the molybdenum is higher than steels with which we have had experience. In our opinion this type of steel would have to be fully annealed before attempting to cold draw it, and in drawing in one pass the draft kept under .020″ if possible, which would very easily produce wire more accurate than plus or minus .002, but would of course raise the hardness somewhat due to the cold working, providing this analysis lends itself to cold drawing.

Cold drawing usually improves machinability, but with such a high alloy as this, it would probably be very desirable, if possible, to machine the bars within a few hours after drawing to minimize as much as possible age hardening which sets in, in cold worked material.

The drawing speeds would probably want to be kept slow, and regular tungsten carbide drawing dies would be the best type of dies to use.

The best way to find out the actual results would be to experiment with a small quantity of this hot rolled material that had been fully annealed, pickled and limed, and then machine some of it at various intervals after the drawing operation."

✦ ✦ ✦

Answer No. 5

"IN order to get a good finish and accurate gauge, I would certainly recommend drawing the material at least two drafts from the rod. The rods should be carefully cleaned and the wire drawn through a lubricant which will leave very little deposit on the wire. Perhaps, graphite might be satisfactory. After it is drawn to finish it should be bright annealed to produce the product free from scale. I understand it is then to be straightened and cut and machined.

By all means, the large size Tungsten Carbide Die should be used. The proper size for the diameter of wire required can be best recommended by the makers of Tungsten Carbide dies.

You ask if drawing one hole would disturb the annealing. I do not understand just what you mean. The drawing operation would have nothing to do whatever with the annealing which takes place after the wire is drawn to finished diameter.

I would expect best results would be obtained if this material were drawn at a relatively low speed, not to exceed from 75 to 100 feet per minute."

✦ ✦ ✦

Answer No. 6

"THE heat treatment can be done in regular cylindrical bell type furnaces, or even, possibly, in large rectangular furnaces, depending on the quantity to be handled. This material is in the classification of tool steel and cannot be pickled before annealing so the atmosphere necessary is one free of nitrogen for which we can provide equipment.

The material will be uniformly annealed so that after it is pickled it can be machined without difficulty on automatic machines and can be drawn through one hole from the rod to finished size in a heading machine."

This is an invitation for you to become a member of The Wire Association.

The Annual Dues are $10.00

For Details Address

Richard E. Brown, Secretary
The Wire Association
300 Main St. Stamford, Conn.

STATISTICS --- MARCH, 1941

PRODUCTION FOR SALE OF IRON AND STEEL PRODUCTS

AMERICAN IRON AND STEEL INSTITUTE
Capacity and Production for Sale of Iron and Steel Products

March - 1941
PERIOD

		Number of companies	Items	* Annual Capacity Net tons	Production for Sale—Net Tons							
					Current Month				Year to Date			
					Total	Per cent of capacity	Shipments: Export	Shipments: To members of the industry for conversion into further finished products	Total	Per Cent of capacity	Shipments: Export	Shipments: To members of the industry for conversion into further finished products
STEEL PRODUCTS	Ingots, blooms, billets, slabs, sheet bars, etc.	32	1	xxxxxxx	529,341	xxx	144,775	159,443	1,650,770	xxx	578,816	405,216
	Heavy structural shapes	8	2	5,175,800	374,135	85.1	12,849	xxxxxxx	1,065,266	83.4	57,815	xxxxxxx
	Steel piling	4	3	360,000	22,663	74.1	3,424	xxxxxxx	62,841	70.8	6,269	xxxxxxx
	Plates—Sheared and Universal	19	4	6,178,270	456,612	87.0	43,720	2,210	1,299,360	85.3	128,320	6,685
	Skelp	8	5	xxxxxxx	96,189	xxx	16,257	37,518	248,705	xxx	34,503	109,110
	Rails—Standard (over 60 lbs.)	4	6	3,613,600	157,796	51.4	9,710	xxxxxxx	431,126	48.4	27,204	xxxxxxx
	Light (60 lbs. and under)	6	7	302,800	17,643	68.6	7,191	xxxxxxx	50,586	67.7	20,264	xxxxxxx
	All other (Incl. girder, guard, etc.)	2	8	102,000	2,012	23.2	115	xxxxxxx	5,691	22.6	1,040	xxxxxxx
	Splice bar and tie plates	15	9	1,300,200	69,817	63.2	2,099	xxxxxxx	181,193	56.5	5,711	xxxxxxx
	Bars—Merchant	35	10	xxxxxxx	543,707	xxx	61,430	80,980	1,618,437	xxx	192,466	185,093
	Concrete reinforcing—New billet	15	11	xxxxxxx	124,043	xxx	20,375	xxxxxxx	336,395	xxx	58,954	xxxxxxx
	Rerolling	17	12	xxxxxxx	10,572	xxx	1,257	xxxxxxx	29,026	xxx	2,613	xxxxxxx
	Cold finished—Carbon	19	13	xxxxxxx	109,313	xxx	1,785	xxxxxxx	294,089	xxx	5,700	xxxxxxx
	Alloy—Hot rolled	15	14	xxxxxxx	145,160	xxx	11,456	14,303	394,685	xxx	39,605	38,725
	Cold finished	15	15	xxxxxxx	15,410	xxx	1,844	xxxxxxx	41,296	xxx	5,256	xxxxxxx
	Hoops and baling bands	5	16	xxxxxxx	9,725	xxx	472	xxxxxxx	23,850	xxx	820	xxxxxxx
	TOTAL BARS	52	17	12,678,585	957,930	88.9	98,669	95,283	2,737,778	87.6	305,414	223,818
	Tool steel bars (rolled and forged)	15	18	127,870	8,777	80.8	443	xxxxxxx	25,432	80.6	2,174	xxxxxxx
	Pipe and tube—B. W.	13	19	2,029,200	122,568	71.1	10,105	xxxxxxx	371,559	74.2	25,427	xxxxxxx
	L. W.	9	20	1,080,260	39,350	42.9	3,826	xxxxxxx	114,892	43.1	6,379	xxxxxxx
	Electric weld	5	21	692,520	38,045	64.7	440	xxxxxxx	92,487	54.1	1,463	xxxxxxx
	Seamless	15	22	3,143,190	184,022	68.9	16,497	xxxxxxx	504,502	65.1	48,243	xxxxxxx
	Conduit	6	23	152,145	11,323	87.6	215	xxxxxxx	32,621	86.9	404	xxxxxxx
	Mechanical Tubing	12	24	514,975	40,792	93.2	3,291	xxxxxxx	112,418	88.5	12,799	xxxxxxx
	Wire rods	18	25	xxxxxxx	131,971	xxx	17,751	21,120	381,874	xxx	47,325	63,646
	Wire—Drawn	36	26	2,299,340	186,165	95.3	13,547	1,815	526,359	92.8	38,464	5,671
	Nails and staples	19	27	1,137,090	72,806	75.4	6,370	xxxxxxx	208,715	74.4	15,736	xxxxxxx
	Barbed and twisted	16	28	448,770	24,701	64.8	5,014	xxxxxxx	70,553	63.7	15,159	xxxxxxx
	Woven wire fence	15	29	786,790	30,411	45.5	302	xxxxxxx	82,746	42.6	688	xxxxxxx
	Bale ties	11	30	124,450	6,947	65.7	4	xxxxxxx	15,676	51.1	40	xxxxxxx
	All other wire products	5	31	27,030	544	23.7	-	xxxxxxx	1,438	21.6	-	xxxxxxx
	Fence posts	14	32	147,645	5,522	44.0	61	xxxxxxx	17,479	48.0	276	xxxxxxx
	Black plate	11	33	542,935	34,027	73.8	1,147		89,291	66.7	3,017	8
	Tin plate—Hot rolled	7	34	842,200	21,072	29.4	1,282	xxxxxxx	60,749	29.2	2,644	xxxxxxx
	Cold reduced	10	35	3,038,860	231,152	89.5	18,378	xxxxxxx	605,672	80.8	50,563	xxxxxxx
	Sheets—Hot rolled	23	36	xxxxxxx	669,915	xxx	26,496	22,887	1,913,409	xxx	87,158	57,264
	Galvanized	14	37	xxxxxxx	159,652	xxx	10,547	xxxxxxx	458,955	xxx	33,733	xxxxxxx
	Cold rolled	15	38	xxxxxxx	299,744	xxx	5,930	xxxxxxx	847,199	xxx	17,986	xxxxxxx
	All other	13	39	xxxxxxx	70,158	xxx	1,733	xxxxxxx	203,825	xxx	5,690	xxxxxxx
	TOTAL SHEETS	26	40	13,151,570	1,199,469	107.3	44,706	22,887	3,423,388	105.5	144,567	57,264
	Strip—Hot rolled	23	41	3,522,380	180,300	60.2	7,212	25,461	512,708	59.0	22,584	67,634
	Cold rolled	34	42	1,385,560	102,251	86.9	1,584	xxxxxxx	288,035	84.3	4,396	xxxxxxx
	Wheels (car, rolled steel)	5	43	422,825	22,288	62.0	6	xxxxxxx	62,626	60.1	151	xxxxxxx
	Axles	4	44	472,280	15,134	37.7	144	xxxxxxx	42,469	36.5	154	xxxxxxx
	Track spikes	11	45	327,275	16,104	57.9	395	xxxxxxx	42,260	52.4	875	xxxxxxx
	All other	4	46	9,100	1,440	186.3	-	xxxxxxx	3,438	153.2	301	xxxxxxx
	TOTAL STEEL PRODUCTS	131	47	xxxxxxx	5,411,319	xxx	491,519	385,737	15,422,703	xxx	1,609,185	939,052
	Pig iron, ferro manganese and spiegel	24	48	xxxxxxx	681,126	xxx	44,119	200,762	1,969,506	xxx	134,742	591,842
	Ingot moulds	4	49	xxxxxxx	66,403	xxx	297	xxxxxxx	182,498	xxx	382	xxxxxxx
IRON PRODUCTS	Bars	9	50	109,195	5,603	60.4	1	117	14,704	54.6	2	705
	Pipe and tubes	3	51	109,300	5,191	55.9	52	xxxxxxx	15,197	56.4	122	xxxxxxx
	All other	2	52	71,000	1,537	25.5	160	-	5,011	28.6	767	-
	TOTAL IRON PRODUCTS (ITEMS 50 to 52)	11	53	224,995	12,331	64.5	213	117	34,912	62.9	891	705

* To be revised

Total number of companies included - 148

The estimated average yield of products for sale from ingots produced by the companies included above is 71.2 *%, which applied to their total ingot capacity equals* 57,533,200 *net tons of finished rolled products. Production for sale, less shipments to members of the industry for further conversion, related to the estimated yield is as follows:*

Current month 5,045,582 *N. T.;* 103.2 *%*
Year to date 14,483,651 *N. T.;* 102.1 *%*

If You Are Not A Member Of The Wire Association—Now Is A Good Time To Join!
The Annual Dues Are $10.00 — For detailed information address
RICHARD E. BROWN, Secretary
300 Main Street, THE WIRE ASSOCIATION Stamford, Conn.

Exports and Imports of Wire

Exports of Iron and Steel Wire Products in March 1941 and March 1940
(In gross tons)

	MAR. 1941	FEB. 1941	MAR. 1940
Wire rods	11,184	12,592	19,124
Strip steel	12,026	13,153	17,360
Plain black or galvanized iron or steel wire	10,841	12,776	13,802
Barbed wire and woven wire fencing	7,188	4,167	2,449
Woven wire cloth	326	277	276
Wire rope	731	1,118	1,011
Other wire and manufactures	959	908	1,343
Wire nails	4,191	3,686	4,254
Tacks	56	100	65
Others nails, including staples	986	574	419
Bolts, machine screws, nuts, rivets and washers	3,948	2,734	1,199
Total, these 11 classifications	52,436	52,085	61,302

Imports of Iron and Steel Wire Into the United States
(In gross tons)

Concrete reinforcement bars	.....	.....	7
Hollow bar and drill steel	61	5	186
Wire rods	66	21	930
Barbed wire	.....	.....	.....
Round iron and steel wire	.....	21	170
Telephone and telegraph wire	.....	.....	.....
Flat wire and strip steel	162	103	336
Wire rope and strand	31	6	97
Other wire	.....	.....	.....
Hoops and bands	.....	.....	100
Nails, tacks and staples	3	.....	21
Bolts, nuts and rivets	6	2	53
Total, these 12 classifications	329	158	1,900

Iron and Steel

EXPORTS of scrap from the United States declined to 54,383 gross tons valued at $1,027,826 in March from the February trade of 74,378 tons valued at $1,455,512, according to preliminary data. Exports of this material in March 1940 totaled 206,928 tons valued at $3,387,037.

✦ ✦ ✦

THE addition of the March trade brought the total exportation of scrap during the first quarter of 1941 to 173,816 tons valued at $3,385,873, 27.5 percent by quantity and 30.6 percent by value of the 629,101-ton, $11,091,893 trade of the January-March period of 1940.

✦ ✦ ✦

INCLUDED in the March 1941 total of 54,383 tons were 53,938 tons of iron and steel scrap, 300 tons of tin-plate circles, and cobbles, and 145 tons of waste-waste tin plate. The iron and steel-scrap total was, in turn, comprised of 15,155 tons of No. 1 heavy melting steel scrap, 23,788 tons of No. 2 heavy melting steel scrap, 2,471 tons of baled and bundled scrap, 2,686 tons cast and burnt scrap, and 9,838 tons of "other" iron and steel scrap.

✦ ✦ ✦

ALL except 3,261 tons of the scrap exported in March was destined for the British Empire.

✦ ✦ ✦

Nonferrous Metals

COPPER imports into the United States for consumption in 1940, including wire but excluding manufactured products, totaled 729,926,580 pounds (copper content) valued at $73,360,250 and exceeded 1939 receipts by about 37 percent in volume. Exports presented the opposite picture, declining about 5 percent from 840,307,366 pounds in 1939 to 801,938,824 pounds valued at $94,323,417 in 1940.

✦ ✦ ✦

APPROXIMATELY 77 percent of the total importation in 1940 was for further processing and ultimate reexportation. Receipts included 644,255,475 pounds of unrefined copper (537,964,890 pounds for smelting, refining, and reexport) and 85,655,082 pounds of refined copper (20,220,998 pounds for further processing and reexport) The 1940 imports reflect a gain in practically every type of copper.

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BY classes, unrefined copper (in the form of regulus, black, or coarse copper) and cement copper accounted for the largest gain, increasing by nearly 98 percent; refined copper in cathodes, ingots, plates, and similar shapes, showed the highest gain in the refined class, rising about 90 percent as compared with the 1939 trade. In the latter group the entire 65,164,762 pounds imported in 1940 was for actual consumption, whereas in the previous year slightly over 49 percent of the importation in this class was for further processing and export.

✦ ✦ ✦

Zinc

THE zinc pool from which the Priorities Division of the Office of Production Management may make mandatory allocations to meet urgent defense needs is to be raised from 5 percent of production to 17 percent for the month of May.

✦ ✦ ✦

FOR the month of April, producers of slab zinc were required to set aside an amount of the metal equal to 5 percent of January production. For May, the 17 percent pool will be based on March production and should amount to approximately 12,000 tons.

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DECISION to increase the size of the pool was made by the Minerals and Metals Group of the Priorities Division after a review of the present situation in the zinc industry.

✦ ✦ ✦

Welding Wire Output Last Year Up 30% to About 119,397 Tons

PRODUCTION of steel welding wire rose to 238,795,000 pounds (about 119,397 net tons) in 1940, a new high record, according to information received by the American Iron & Steel Institute.

✦ ✦ ✦

THE increase reflected wider use of welding processes than ever before in shipbuilding, construction work, the manufacture of home equipment and numerous other fields.

(*Please turn to Page 346*)

Welding Wire Output

(*Continued from Page 345*)

LAST year's output of welding wire represented an increase of 30% over the 1939 production of 183,436,000 pounds the highest total previously recorded.

✦ ✦ ✦

BETWEEN 1932 and 1940 the production of steel welding wire rose 989%. This gain was more than twice the increase in production in steel ingots which amounted to 442% between 1932 and 1940.

✦ ✦ ✦

NEARLY five pounds of welding wire were produced last year for each net ton of finished steel produced, compared with 2.6 pounds in 1939.

✦ ✦ ✦

Canadian Steel Industry

STEEL production in the Dominion was on the basis of 2,150,000 long tons a year and, by next January is expected to reach an annual rate of 2,500,000 tons, according to the Steel Controller.

IMPORTS are now on the basis of 1,200,000 tons a year—double the previous average. The Steel Controller anticipates that, barring unforeseen difficulties, Canada's estimated requirements of steel, 3,100,000 tons in 1941, will be satisfied. To guard against a possible shortage, no priority permits are being granted for the use of steel, for the construction of schools, churches and bridges, or for commercial and industrial buildings, except those required in the Defense effort.

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Machinery Purchases By the Wire Industry for 1939

THE Industrial Reference Service of the U. S. Department of Commerce, in a release entitled "Business Series No. 5, May, 1941," outlining the Nation's Expenditures for Industrial Plant and Equipment during the year 1939, presented the following information relating to the wire industry.

✦ ✦ ✦

OUT of 79 establishments in the Insulated Wire and Cable industry producing products valued at $120,390,050, 60 of them representing 98.6% of the total production, spent $2,594,507 for new plant and equipment.

✦ ✦ ✦

OF these expenditures $436,542, representing 16.8% of the total was spent for building and plant structures, while $2,058,509 representing 79.3% of the total expenditures was for new machinery and operating equipment.

✦ ✦ ✦

SECOND hand machinery was purchased to the extent of 3.8% amounting to $99,456.

✦ ✦ ✦

STATISTICS from 95 mills which buy steel rod to draw wire, with a total production of $176,503,111, show that 81 mills with a total production of $159,971,615, representing 90.6% of the total value of the products manufactured for the industry, spent $3,439,057 for additional plant and equipment during the year.

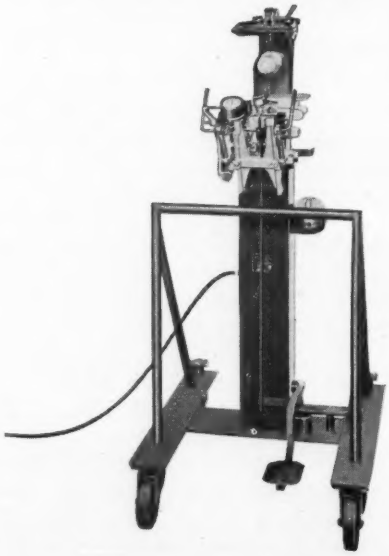
(*Please turn to Page 366*)

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



MICRO PRODUCTS COMPANY

20 NORTH WACKER DRIVE, CHICAGO, ILL.

Telephone, State 7468

Outstanding Personalities of The Wire Industry

(*Continued from Page 342*)

by **Mr. J. R. Gaut** who is being transferred from the Vice President's office in Cleveland.

✦ ✦ ✦

VAN H. LEICHLITER, formerly Superintendent of Wire Mill, Cuyahoga Works, Cleveland, has been appointed Superintendent, Wire Mills, South Works, Worcester to be in charge of the consolidation of Worcester wire mills under the present rehabilitation program. He succeeds **F. P. Leahey**, who has been appointed Superintendent, Wire Mill, Cuyahoga Works.

✦ ✦ ✦

DANIEL LYNCH has been appointed Superintendent of the Rockdale Division, Joliet, and **R. E. Camp,** Superintendent of the Scott Street Division. Both men have been Assistant Superintendents of these divisions.

✦ ✦ ✦

AT the same time, at Waukegan, **R. L. Lewis** has been appointed Superintendent of Engineering and Maintenance, **W. B. McShane,** Superintendent of the Wire Mills, **J. H. Thomas,** Superintendent of Spring Mills, and **Thomas Tyrrell,** Superintendent of Rod Mills.

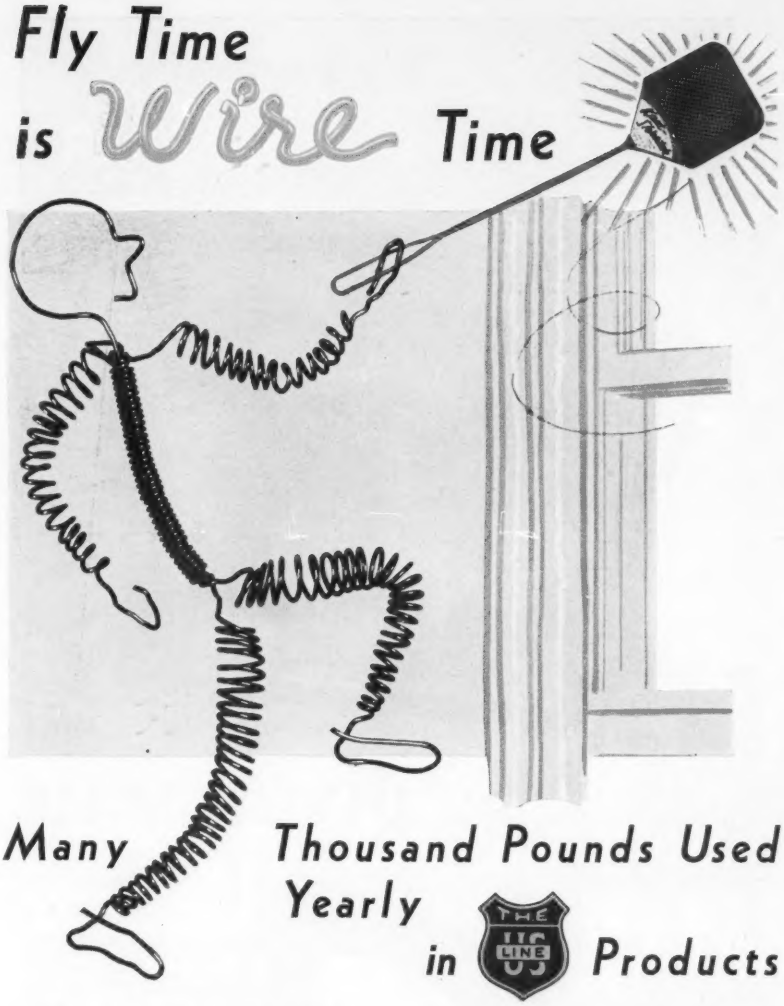
✦ ✦ ✦

Skilled Workers Needed by Government

IN the past eight months of intensive effort to locate qualified skilled machinists and shipbuilding workers for arsenals, army air depots, and naval shore establishments, the U. S. Civil Service Commission announced today, over 10,000 highly skilled munitions and shipbuilding workers have been put on the job at establishments where, because of the labor supply or geographical location, these skilled positions are particularly hard to fill. This number of placements does not include those in localities where little or no difficulty in recruiting has been experienced, and it is but a small fraction of the total number of placements made in the War and Navy Departments as a whole, where the figure for the 8-month

(*Please turn to Page 348*)

Fly Time is Wire Time



Many Thousand Pounds Used Yearly in THE U S LINE Products

Fly time. Thousands of folks are well prepared to swat their way through with U. S. "Kant-Skratch" swatters. Also roasting forks, broiler utensils and corn poppers are included in the popular "U.S. Line" of specialties. They're produced in the hundreds of thousands by the U. S. Manufacturing Corporation, Decatur, Illinois. And a long time feature of this successful line is Keystone wire — many thousand pounds of it every year.

Here's an interesting example of mass production that flows smoothly — facilitated by wire that's consistently *right* for the respective requirements. Gives you some idea of how wire performance can aid all important manufacturing economy — and customer satisfaction.

KEYSTONE

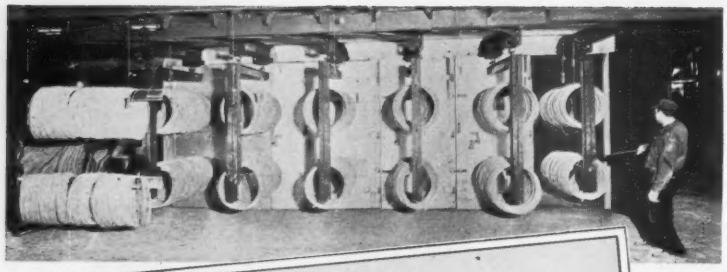
STEEL & WIRE CO. Dept. W PEORIA, ILLINOIS

HIGH CARBON OR LOW CARBON

SAMSON SPRING WIRE

REG. U.S. PAT. OFF. KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright-Tinned Coppered Annealed Galvanized



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An advanced method of baking that uses air at high temperature but free from the products of combustion. An economical use of heat that assures uniform temperature distribution and greatly shortens the baking cycles. Temperature is absolutely controlled. Utmost ease and comfort in loading and unloading. Requires minimum floor space. Write for full particulars.

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CHICAGO 201 North Wells Street DETROIT 12953 Greeley Avenue

ROSS ENGINEERING OF CANADA, LIMITED, Dominion Square Building, Montreal

Skilled Workers Needed By Government

(*Continued from Page 347*)

period is over 270,000, including various grades of skilled, unskilled, and professional positions in both the field and the departmental service.

✦ ✦ ✦

THE needs of the various National Defense Agencies for skilled workers have increased rapidly.

✦ ✦ ✦

FOF example, 135 shipfitters are urgently needed at the navy yards at Mare Island, Calif., Bremerton, Wash., Philadelphia, Pa., Charleston, S. C., and Portsmouth, Va., although in the past 8 months over 1,400 shipfitters have been put on the job at these and other navy yards.

✦ ✦ ✦

OVER 400 machinists are now needed at the arsenals at Watervliet, N. Y., Rock Island, Ill., Philadelphia, Pa., Watertown, Mass., and Edgewood, Maryland, and at the navy yards at Philadelphia, Pa., Washington, D. C., Mare Island, Calif., Boston, Mass., Charleston, S. C., and at Bremerton, Wash., as well as at the Naval Station at Key West, Fla. In the past eight months well over 4,000 machinists have been put to work at Government arsenals and navy yards.

✦ ✦ ✦

OVER 300 qualified toolmakers are needed at the arsenals at Watervliet, N. Y., Philadelphia, Pa., Dover, N. J., Watertown, Mass., and Springfield, Mass., and at the navy yards at Washington, D. C., Philadelphia, Pa., Charleston, S. C., and Bremerton, Wash. Approximately 775 toolmakers have been appointed at these establishments in the past eight months.

✦ ✦ ✦

SEVERAL tool and gage designers are needed at the Watervliet Arsenal and Washington (D. C.) Navy Yard.

✦ ✦ ✦

INSTRUMENT makers are needed at the Philadelphia Arsenal and at the Washington (D.C.) Navy Yard.

(*Please turn to Page 349*)

Skilled Workers Needed By Government

(*Continued from Page 348*)

APPLICATIONS for any of these positions at a navy yard should be filed with the Labor Board at the navy yard where employment is desired; or, for positions at an arsenal, with the Secretary, Board of U. S. Civil Service Examiners, at the arsenal in which employment is desired.

✦ ✦ ✦

AT Wright Field, Dayton, Ohio, over 450 skilled aircraft and maintenance mechanics have been appointed since January 1, 1941, yet at the present time there is an urgent need there for over 450 additional aircraft mechanics, electricians, engine mechanics, and wire-workers. Aircraft maintenance and repairmen are also needed now at the Naval Air Stations at Jacksonville and Pensacola, Fla.; at Alameda and Sacramento, Calif.; and at Corpus Christi and San Antonio, Texas.

✦ ✦ ✦

A Handbook on Priorities

A HANDBOOK on the operation of the priorities system is now available for general distribution upon application to the Division of Information, Office for Emergency Management, new Social Security Building, Washington, D. C.

✦ ✦ ✦

CALLED "Priorities and Defense," the booklet includes a general statement on the theory and administration of the priorities system, a question and answer section, a copy of the Priorities Critical List, the official instructions on priorities to Supply Arms and Services of the Army and Bureaus and Offices of the Navy Department, reproductions of preference rating forms, and other material.

✦ ✦ ✦

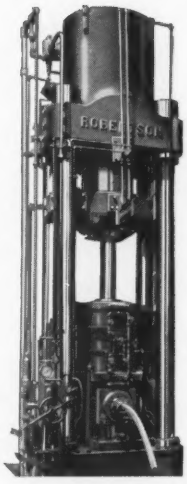
THE handbook can be made available in quantities to trade associations or other agencies which want to distribute the material to members.

DO YOU GET IT?

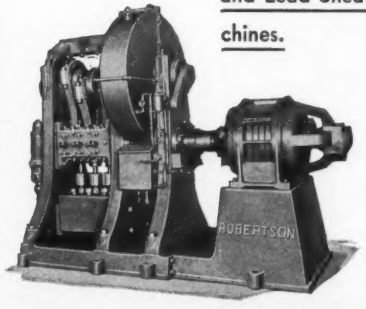
★

REFRESHER-4 TIMES A YEAR

A spot of philosophy, several chuckles' worth of humor, a dash of something out of the ordinary, a measure of "quotes" from others about this and that . . . is the recipe that spells ROBERTSON REMINDERS, published quarterly for your enjoyment by John Robertson Co., Inc.



Further, there's news about up-to-the-minute developments in Robertson equipment which includes all types of lead encasing machinery required by rubber hose and electrical cable makers — Extrusion Presses, Hydraulic Pumps, Melting Furnaces and Pots, Dies and Cores, Hydro-pneumatic Accumulators and Lead Sheath Stripping Machines.



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X-Ray Analysis of Hot-Galvanized Heat-Treated Coatings

(*Continued from Page 333*)

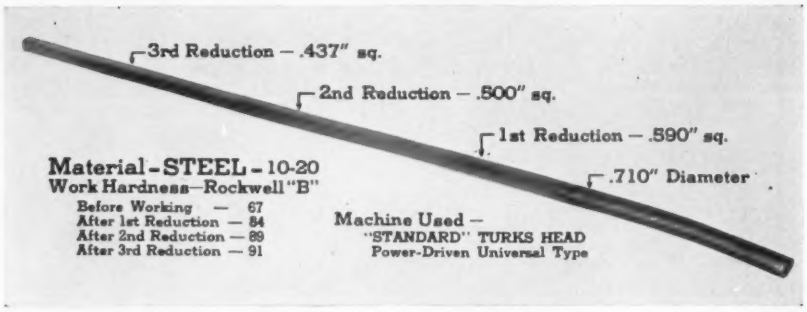
in this work was 15.229 centimeters.

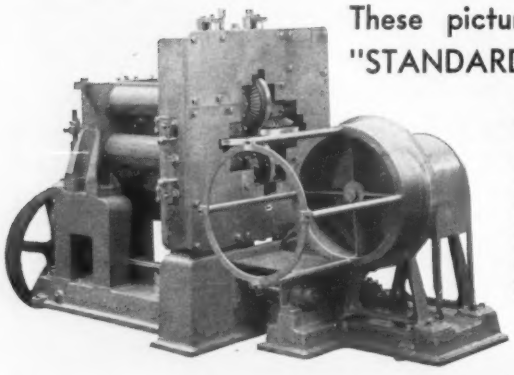
✦ ✦ ✦

THE sample was examined at different glancing angles, to bring different regions of the picture into focus at different times. From these a composite table was made (Table 3). This composite picture was verified by making an X-ray diffraction analysis on heat-treated galvanized wire.*[1] The intensities of the lines were hard to evaluate on a composite diffraction photogram. They are indicated in Table 3 with reservations. The angles indicated in the table refer to cobalt $K\alpha_1$ radiation to permit comparison with published work.[10]

✦ ✦ ✦

IN Fig. 3 a comparison is made of the data of Schramm[10] with the diffraction data from the present sample. Such a chart does not give an accurate check on the work. It permits only a rapid graphic survey of the various phases present.

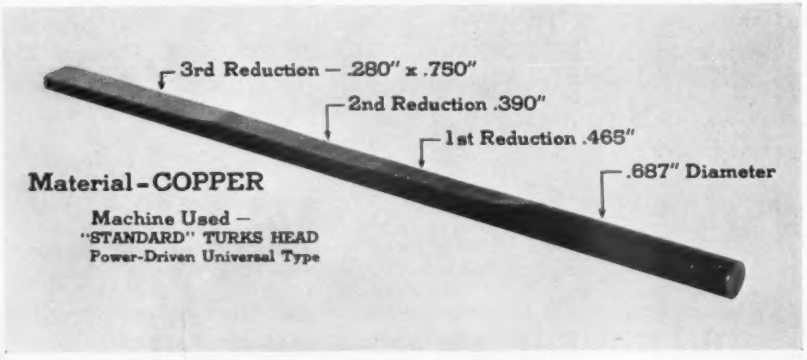

3rd Reduction — .437" sq.
2nd Reduction — .500" sq.
1st Reduction — .590" sq.
.710" Diameter
Material - STEEL - 10-20
Work Hardness—Rockwell "B"
Before Working — 67
After 1st Reduction — 84
After 2nd Reduction — 89
After 3rd Reduction — 91
Machine Used —
"STANDARD" TURKS HEAD
Power-Driven Universal Type



These pictures tell the "STANDARD" TURKS HEAD Story.

Above—10-20 carbon steel, .710" diameter reduced to .437" square with sharp corners in three passes; below, .687" diameter copper reduced to rectangular shape .280" x .750" in three passes.

Visualize this in terms of your own work, then write, stating your requirements (shape, stock, production, etc.), and we shall be glad to send specific recommendations including price and delivery.



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Discussion of Results

IT is evident from the data in Table 3 and Fig. 3 that all of the intermediate phases of the iron-zinc system are found in the heat-treated zinc coating. The zeta phase is predominant. Schueler[1] found by chemical analysis that 60 per cent of the heat-treated galvanized coating consisted of a new phase, which he designated $FeZn_{10}$. From the diffraction data presented here and the above fact, it seems evident that the phase found by Schueler and the zeta phase ($FeZn_{13}$) are the same intermetallic compound.

✦ ✦ ✦

THE chemical analysis of the heat-treated zinc coating showed 10 per cent of iron, which is somewhat high for such a coating, the average analysis being about 8 per cent. The homogeneity range of the zeta phase is 6 to 6.2 per cent Fe. A relatively large amount of zeta material would be expected, therefore, the remaining iron being taken care of by $FeZn_7$ (7 to 10 per cent Fe) and Fe_5Zn_{21} (20.5 to 28 per cent Fe).

✦ ✦ ✦

THE phases present in heat-treated zinc coatings have been checked on wire, although the data presented here were obtained from a sheet sample.

✦ ✦ ✦

Summary

THE recent investigations on the iron-zinc system are summarized.

✦ ✦ ✦

THE X-ray diffraction analysis of heat-treated zinc coatings on sheets (and on wire) shows that the alloy layers consist mainly of the zeta ($FeZn_{13}$) phase. Zinc, small amounts of Fe_5Zn_{21} and δ_1 phase are also present in the coating.

✦ ✦ ✦

THE zeta phase corresponds to the phase found by Schueler in 1925.

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(*Please turn to Page 351*)

X-ray Analysis of Hot Galvanized Heat-Treated Coatings

(*Continued from Page 350*)

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✦ ✦ ✦

Fuel Purchases By the Wire Industry for 1939

THE Industrial Reference Service of the U. S. Department of Commerce, in a release entitled "Business Series No. 5, May, 1941" outlining the Industrial Coal Consumption for 1939 reported as follows: 153 plants out of 155 engaged in the manufacture of bolts, nuts, washers and rivets, made in plants not operated in connection with rolling mills, reported the use of fuel for 1939 as follows:

Anthracite Coal—464 tons of 2,000 lbs.
Bituminous Coal—84,489 tons of 2,000 lbs.
Coke—1,604 tons of 2,000 lbs.
Fuel Oil (Barrels—42 gals.)—173,664.
Gas—(M cubic feet), Natural, 656,534—Manufactured, 206,757—Mixed, 14,044.

✦ ✦ ✦

REPORTS received from 73 plants out of 79 engaged in the manufacture of insulated wire and cable show that the use of fuel for 1939 was as follows:

Anthracite Coal—4,410 tons of 2,000 lbs.
Bituminous Coal—101,366 tons of 2,000 lbs.
Coke—21 tons of 2,000 lbs.
Fuel Oil (Barrels—42 gals.)—99,596.
Gas—(M cubic feet), Natural, 184,083—Manufactured, 169,452—Mixed, 1,906.

✦ ✦ ✦

SIX hundred and sixty plants out of 669 engaged in the manufacture of wirework not elsewhere classified, reported the use of fuel during 1939 as follows:

Anthracite Coal—8,269 tons of 2,000 lbs.
Bituminous Coal—84,966 tons of 2,000 lbs.
Coke—983 tons of 2,000 lbs.
Fuel Oil—(Barrel—42 gals.)—102,759.
Gas—(M cubic feet)—Natural, 264,427—Manufactured, 224,304—Mixed, 94,-311.

SAVE ZINC

In your hot galvanizing operations with

DEWALCO LIQUID BLANKET

★ PREVENTS FORMATION OF ZINC OXIDE

★ CUTS HEAT LOSSES

★ REDUCES DROSS

Cutting your waste of zinc metal increases the amount of material you can galvanize with your present stocks of prime metal.

WRITE FOR DETAILS

DEWEY AND ALMY CHEMICAL COMPANY • CAMBRIDGE, MASS.

A Review of Recent Wire Patents

No. 2,236,733, METHOD OF AND APPARATUS FOR MAKING SOCKETED SCREWS, patented April 1, 1941 by William A. Purtell, West Hartford, Conn., assignor to The Holo-Krome Screw Corporation, a corporation of Connecticut.

This method consists in successively upsetting and reducing a head on one end of a blank of uniform diameter as the socket is formed in the upset end and as the end is moved successively longitudinally into communicating apertures of different diameters in the same die while laterally confining the opposite end of the blank in the smaller aperture to prevent the formation of a head thereon during upsetting.

✦ ✦ ✦

No. 2,237,338, RIVET, patented April 8, 1941 by Hubert S. Dale, Middle River, Md., assignor to The Glenn L. Martin Company, Baltimore, Md.

The head of the rivet has an under surface tapering toward the stem and has a dished upper surface.

✦ ✦ ✦

No. 2,237,371, WIRE DRAWING APPARATUS, patented April 8, 1941 by Abraham Simons, New York, N. Y.

In this construction there is a turnable drum having a base portion on which the wire can be coiled in a plurality of superposed turns, the drum having grooved means below the base portion, the periphery of the groove of the

Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.

grooved means being circular, a turnable back-pull member having a groove whose periphery is of circular shape, the back-pull member being located below the grooved means and being mounted to be turnable about the same axis of revolution as the drum, slip-coupling means between the drum and the back-pull member, a die, guide means adapted to guide the wire to the groove of the back-pull member and then successively to the die and from the die to the grooved means, the diameter of the periphery of the groove of the grooved means being sufficiently greater than the diameter of the groove of the back-pull member to cause the back-pull member to turn at greater angular velocity than the drum when the device is operated, and slip-coupling means between the drum and the back-pull member.

✦ ✦ ✦

No. 2,237,431, FIBROUS JACKET FOR INSULATED CONDUCTORS, patented April 8, 1941 by Anthony P. Hinsky, Brooklyn, N. Y., assignor to Pyro Products Corporation, Brooklyn, N. Y., a corporation of New York.

A number of non-extensible fibrous strands are arranged within the braid of the sheath, longitudinally of the wire conductor at circumferentially spaced intervals.

✦ ✦ ✦

No. 2,237,527, DIE BOX FOR WIRE DRAWING MACHINES, patented April 8, 1941 by Kenneth B. Lewis, Worcester, Mass., assignor to The Aetna-Standard Engineering Company, Youngstown, Ohio, a corporation of Ohio.

Side and bottom adjustment (screws) of the die within the die box is provided with respect to the path of the wire.

✦ ✦ ✦

No. 2,237,741, BOX NAIL, patented April 8, 1941 by Harry B. Lindsley, Wauwatosa, Wis.

While this nail may be driven into wood, the head comprises a relatively long thin portion which may be bent over into contact with the outer face of the member into which the shank is driven.

✦ ✦ ✦

No. 2,238,156, SPRING STRUCTURE FOR MATTRESSES, patented April 15, 1941 by Lloyd O. Coiner, Carthage, Mo., assignor to Leggett and Platt Spring Bed and Manufacturing Company, Carthage, Mo.

This assembly includes a series of vertically disposed relatively heavy spiral springs, an intermediate section having a larger number per unit area of relatively light weight vertically disposed spiral springs to increase the resilience

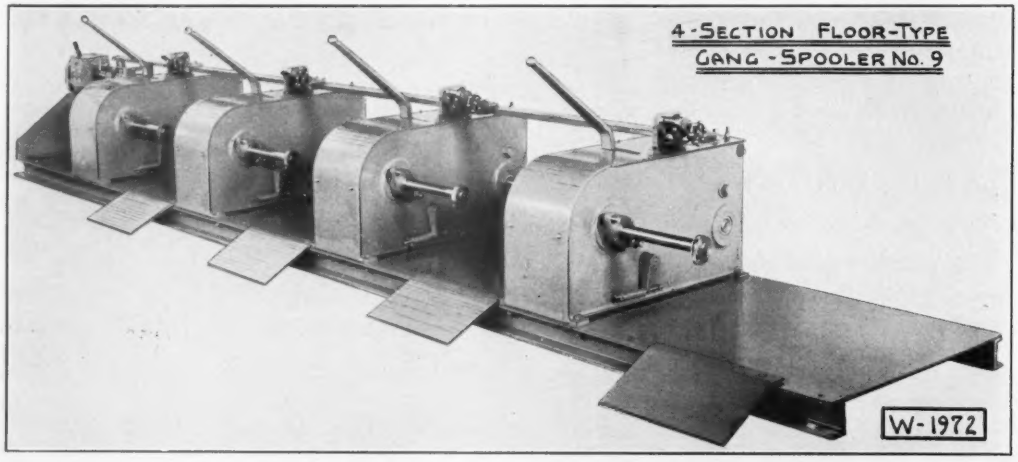
THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

GANG SPOOLERS — FOR 4" - 8" - 12" - 16" - 22" (SHOWN) & 24" SPOOLS

FLOOR AND TABLE TYPES — PRINTED MATTER ON REQUEST —



Heavy-Duty Compact Design — All Ball & Roller Bearing — Combined Start & Brake Handles — Wide Range Automatic Traverse — Covered Steel Base All Adjustments in Operation.

of the intermediate section, the corresponding top and bottom convolutions of adjacent springs being disposed adjacent each other, and a series of top and bottom transverse small diameter coil springs disposed between each row of vertically disposed spiral springs and engaging the overlying portions of the top and bottom convolutions of adjacent springs respectively.

✦ ✦ ✦

No. 2,238,610, WIRE ENAMELING, patented April 15, 1941 by Phillips Thomas, Edgewood, Pa., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania.

More specifically, the invention relates to a method of determining the dielectric condition of the insulating coating on wire.

✦ ✦ ✦

No. 2,238,651, INHIBITION OF CORROSION, patented April 15, 1941 by Frank G. Keenen, Wilmington, Del., assignor to E. I. duPont de Nemours & Company, Wilmington, Del., a corporation of Delaware.

In order to prevent the effect of ammoniacal ammonium nitrate solutions on iron, the method comprises adding to the solutions a small quantity of thiourea.

✦ ✦ ✦

No. 2,238,687, APPARATUS FOR COATING WIRES AND THE LIKE, patented April 15, 1941 by Edward J. Flynn, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.

A die assembly is provided, comprising a die including apertured means for uniformly reducing to predetermined thickness the coating on the conductor being coated, means slidably supporting said die for limited lateral and longitudinal movement, and restraining means for limiting said longitudinal movement.

✦ ✦ ✦

No. 2,239,114, MACHINE FOR MAKING CHAINS, patented April 22, 1941 by Frederick A. Olmstead, Cleveland Heights, Ohio, assignor to The Hodell Chain Company, Cleveland, Ohio, a corporation of Ohio.

This machine is adapted for making welded wire chain.

✦ ✦ ✦

No. 2,240,051, CUSHION SPRING STRUCTURE, patented April 29, 1941 by Anthony J. O'Malley, Arlington, N. J., assignor to Spring Products Corporation, New York, N. Y., a corporation of New York.

Upper and lower frame wires are provided, surrounding the opposite end convolutions of the outermost springs, these frame wires having their ends overlapped and provided with mating inwardly offset portions, the spring convolutions adjacent these overlapped ends having offset portions registering with the offset portions of the overlapped ends of the frame wires.

✦ ✦ ✦

No. 2,240,058, ARTICLE OF MANUFACTURE, patented April 29, 1941 by Clyde N. Stover, Baltimore, Md., assignor to Western Electric Company, Incorporated, New York, N. Y., a corporation of New York.

A wire conductor has a knitted covering formed of interconnected wales, some of which are unevenly spaced to form an identifying portion in the covering.

No. 2,240,185, METHOD OF TANGLING WIRE, patented April 29, 1941 by Daniel E. Hennessy, Leominster, Mass., assignor to Springfield Wire & Tinsel Co., West Springfield, Mass., a corporation of Massachusetts.

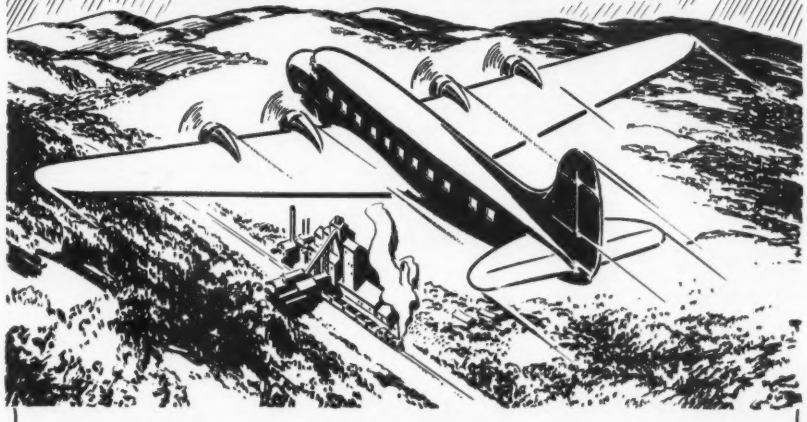
The method comprises forming a helical coil with the wire under a stress having a tendency to cause the helix to untwist, and progressively releasing the stressed helix for local rotation while holding the released product against rotation as a whole.

✦ ✦ ✦

New Representative Appointed by Upton Electric Furnace Co.

ANNOUNCEMENT of the appointment of **Frank K. Ziegler,** 9 South Clinton Street, Chicago, to handle the complete line of Upton Electric Salt Bath Furnaces in the Chicago area was made by Charles R. Pollock, Sales Manager, Upton Electric Furnace Company. Territory to include adjacent portions of Michigan, Indiana and Wisconsin. The "electrothermic-permeation" principle of operation of the Upton furnaces is said to afford sufficient flexibility to permit the use of the furnaces for virtually any salt bath heating operation requiring temperatures of from 300 to 2500 degrees Fahrenheit.

HIGH IN THE AIR



and **DEEP IN THE EARTH** - **KESTER SOLDERS**

Protect Vital Electrical Wiring

Wherever electrical wiring is used—above, on, or under the ground—Kester Rosin-Core Solder guards electrical circuits, makes them safe against fire-hazard, and permanent for the life of the installation.

The pure rosin flux is non-conducting and non-corrosive. The quantity of flux is scientifically balanced with the quantity of alloy, insuring neat, exact results. And the convenient form of Kester Solders, with the flux self-contained in the core, makes them faster and easier to use.

There is a Kester Cored Solder ideally suited to every industrial soldering requirement—countless combinations of different alloys and fluxes, in various core-sizes and strand sizes, from which to choose the one best combination for any type of work. Consult Kester engineers freely, without obligation, about any construction or plant maintenance problem that solder might help you to solve.

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KESTER CORED SOLDERS

STANDARD FOR INDUSTRY

Mathematics for the Wire Mill

(*Continued from Page 331*)

(11a) Uniform % reduction per draft for various total reductions.

A MODIFICATION of the above formula, knowing the starting size and finish size, is as follows:

$$X = 1 - \sqrt[N]{\frac{D_W^2}{D_R^2}}$$ where

X = % Reduction per Draft
N = Number of Drafts
D_W = Dia. of Wire at Finish
D_R = Dia. of Rod or Starting Material

Since by definition

$$dA = 1 - \frac{D_W^2}{D_R^2}$$

By substituting in the formula (11), the result is

$$X = 1 - \sqrt[N]{1 - (1 - \frac{D_W^2}{D_R^2})}, \text{ which becomes}$$

$$X = 1 - \sqrt[N]{\frac{D_W^2}{D_R^2}}$$

✦ ✦ ✦

Marking Tool for Shells Announced By New Method

DEVELOPED especially for marking parts such as shells or other ordnance units, indexing rolls, etc., while being produced on automatic screw machines, lathes, etc., New Method Steel Stamps, Inc., Detroit, is now manufacturing a rotary or roll-type marking device, with solid die. Service installations on more than a dozen automatic screw machines turning 37 mm shells have shown their ability to automatically make clean-cut identifying marks in high production.

✦ ✦ ✦

IN use on an automatic screw machine, the marking roll fits into a holder which has a fine adjustment for starting the marking operation when the roll is brought into contact with the part. After completing the marking operation, the roll is returned to initial position by a coiled spring mounted on the end of the roll shaft. The roll is so designed that continuous contact with the part after marking does not cause it to rotate and re-mark the surface. Only a single impression is made, even though the part continues to rotate before the roll is withdrawn from contact.

✦ ✦ ✦

VARIOUS forms of holder shanks are available so that the device can be adapted to most applications where the marking of rotating parts in production is required. Another type with interchangeable die has also just been developed.

Speed Defense Production

If it's a defense part that requires processing through dies, you can do the job faster and at lower production cost with Teco Dies. The near-diamond hardness of Teco Carbide Dies means less die wear, longer life on size and smoother, more accurate finishes. Speed production on your defense requirements, and get the extra saving of today's low carbide prices — specify the finest carbide dies, TECO for superior performance. A Tungsten Electric engineer will be glad to discuss your requirements with you. Consult us today.

Pioneers in Tungsten Carbide for over a Quarter of a Century

NEVER SAY DIE . . . *always specify*
TECO CARBIDE DIES
for smooth wire drawing . . . THEY LAST LONGER
Tungsten Electric supplies carbide blanks, tools, bits. Wire and bar dies, tubing, extruding and sizing dies. Also, special tools, such as spot facers, reamers, broaches, form tools, etc.

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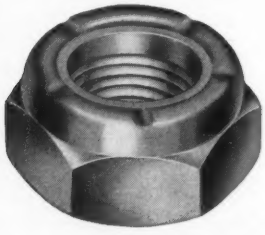
Branch Office - 2900 Euclid Ave., Cleveland, O.

Elastic Stop Announces Thin Hex Nuts

FOR use on shear bolts where a high degree of the stress is lateral, and for general application to light and medium stress fastenings, an improved line of thin hex nuts is announced by Elastic Stop Nut Corporation, 2332 Vauxhall Road, Union, New Jersey.

✦ ✦ ✦

THESE nuts have approximately 40 percent of the strength of standard-height hex nuts and have been developed to meet the demand in virtually every industry for a self-locking fastening which offers savings in space requirements, weight, and cost. An indication of their suitability is the fact that they are approved for use on aircraft by all of the military and civil authorities.



AS in the standard-height Elastic Stop Nuts, the self-locking action is accomplished by means of a vulcanized fiber collar which is built into the head of the nut. This tough bone-like material resists the entry of the bolt, thus forcing the nut outward and taking up all thread play. The fiber, being non-metallic and of a resilient character, does not deterioriate under vibration, and so continues to hold the threads of nut and bolt in a constant pressure-contact.

✦ ✦ ✦

THE nuts are available in steel, brass, and aluminum, in a complete range of standard sizes, both coarse and fine thread. A folder, sent upon request to the manufacturer, explains in detail the Elastic Stop self-locking principle.

✦ ✦ ✦

New Bulletins of Interest to Wire Mills

THROUGH continuous study and laboratory development the Wheelco Instrument Company of Chicago has brought its instruments for the control of combustion to a high point of practical efficiency.

✦ ✦ ✦

THE Company has recently brought out a number of new bulletins describing its new potientometers for the close control of combustion in furnaces, ovens, heaters, etc., that may be used in connection with any type of fuel. These instruments are designated as Capacitrol, for the mechanical control of temperature, the Flame-Otrol, for the safeguarding of flame, Therm-Otrol, for indicating and recording heat conditions, etc. These bulletins may be had upon request to the Wheelco Instrument Company or by writing the Editor of WIRE & WIRE PRODUCTS, and will give in detail, the ranges, sizes and applications of Wheelco's complete line of instruments, portable and otherwise.

When you buy

SPOOLS and REELS

consider the advantages "American" offers

V The skill and experience to make them right.

V The capacity to meet your needs.

We have the tools, the dies, and all the modern equipment necessary to produce pressed-steel spools and reels skillfully, quickly, and economically.

Widely used in the wire industry for production operations and shipping, "American" Pressed-Steel Spools are light, clean, and sturdy. They will not break, chip, crack, or warp.

"American" Pressed-Steel Reels are equally indestructible. They meet every requirement of braiding, drawing, annealing, vulcanizing, and shipping.

The services of our Engineering Department are available, without obligation. Let us quote on your requirements.

The American Pulley Company
4255 Wissahickon Avenue, Phila., Pa.

Special Representative
WALTER A. RICHARDS
20 N. Wacker Drive
Chicago, Ill.

AMERICAN
Pressed-Steel
SPOOLS AND REELS

Liquid Blanket for Hot Galvanizing Baths

THE formation of oxides on galvanizing baths is the cause of the loss each year of millions of pounds of pure zinc in the galvanizing industry. This zinc oxide which is formed by the action of the oxygen in the air on the hot molten zinc contains 70% zinc, and since the recovery value is small the formation of such zinc oxide, or "ash" as it is sometimes called, represents a loss totaling hundreds of thousands of dollars.

✦ ✦ ✦

ATTEMPTS have been made to prevent the formation of this oxide by covering the exposed surface of molten zinc with dry materials, but these dry materials have not been satisfactory because they permit the passage of oxygen, and because they interfere with the drossing operation. In addition, on wire kettles a dry powder blanket interferes with the feeding through of the wire.

✦ ✦ ✦

DEWEY and Almy, manufacturing chemists of Cambridge, Mass., have developed a liquid blanket for zinc baths which completely seals off the surface of the zinc preventing contact with air, and so eliminating the formation of costly oxides. This fluid blanket may be drossed through, zinc may be fed through it, wire and pipe may be threaded through it without in the least disturbing the continuity of the blanket.

✦ ✦ ✦

AS furnished, this blanket is in the form of white crystals, known as Dewalco Galvanizing Blanket Crystals. When these Blanket Crystals are placed on the molten zinc bath they melt rapidly to form a thin fluid blanket which completely covers the entire surface, effectively sealing the molten zinc away from the air. A thick blanket is not required, hence only approximately six pounds per square foot of surface is all that is needed to make an effective blanket. While the blanket is in use it gradually becomes pasty, but may be kept in a fluid condition by occasional addition of small quantities of Blanket Crystals.

EXPERIMENTS have shown that the quantity of Galvanizing Blanket Crystals needed to maintain the fluidity of the blanket may be kept at a minimum by the use of a special formulation for crystals that are added, and a different formulation for the crystals which make the original blanket.

✦ ✦ ✦

THIS liquid blanket has been developed primarily for those operations which expose a large surface of zinc to oxidation and which are so arranged that the work to be galvanized may be fed in at one location and removed at another. Wire and pipe galvanizing are the operations which most require such a blanket, and it is especially for these operations that the Dewalco Liquid Blanket has been developed.

✦ ✦ ✦

THE advantage of the Dewalco Liquid Blanket may be briefly summarized as follows:

(1) Large saving of zinc through elimination of formation of costly oxides.

(*Please turn to Page 357*)

THE ANNUAL MEDAL AWARD
OF THE
WIRE ASSOCIATION
FOR THE MOST MERITORIOUS PAPER ON
WIRE MANUFACTURE OR FABRICATION DURING THE YEAR

ALL members of the Wire Association are cordially invited to submit technical papers either for publication in "WIRE & WIRE PRODUCTS" during the year or for presentation before the Annual Wire Association Meeting at Philadelphia, October 20-24, 1941.

✦ ✦ ✦

FOR 1941 and subsequent years a medal will be awarded in each of the two major divisions of the activities of the Association, to the papers coming nearest to the requirement set forth above.

✦ ✦ ✦

CONSIDERATION for the Medal Awards is not limited to the papers presented at the Annual Meeting, but is given to all papers submitted by members and published in "WIRE & WIRE PRODUCTS" during the year.

✦ ✦ ✦

SELECTION of papers to be presented at the Annual Convention rests in the hands of the Joint Program Committee of the Wire Association.

✦ ✦ ✦

ALL papers submitted become the property of the Wire Association, and the Board of Directors constitutes the Committee on Awards.

✦ ✦ ✦

ADDITIONAL information may be obtained by addressing:

RICHARD E. BROWN,

SECRETARY, THE WIRE ASSOCIATION

STAMFORD TRUST CO. BLDG., STAMFORD, CONNECTICUT

Liquid Blanket for Hot Galvanizing Baths

(*Continued from Page 356*)

(2) Reduction of heat losses, — saves gas and improves working conditions.
(3) Saving of time during and ease of drossing operation.
(4) Reduction in percentage of dross formed.
(5) Minimizing of spattering when fluxed work enters hot zinc bath.
(6) More work galvanized per ton of zinc.

✦ ✦ ✦

Actual Zinc Savings From Use of Dewalco Liquid Blanket on a Wire Galvanizing Kettle

LARGE savings of metallic zinc, both as **oxide skimmings** and as **dross** are made by using the Dewalco Liquid Blanket on hot galvanizing kettles, because this fluid blanket not only covers the molten zinc and forms a liquid seal to keep air away, thereby preventing **oxide formation;** but also provides excellent heat insulation thus reducing heat input to the kettle and consequently lowering the amount of **iron-zinc dross formed.**

✦ ✦ ✦

THE data tabulated below is not presented as typical because wire galvanizing kettles vary so in size, construction, method of firing, tonnage capacity, and because other factors such as flux, temperature of operation, and gauge wire being galvanized will obviously greatly influence the comparison. However, the savings presented here are **actual** savings on a four weeks carefully conducted test by a large manufacturer of galvanized wire, and show the kind of savings obtained by using the Dewalco Liquid Blanket.

✦ ✦ ✦

IN this test no measure was made of the gas saving, but obviously it must have been substantial in view of the amazing reduction in dross, and the fact that the surface of the Liquid Blanket was **410 degrees cooler** than the surface of

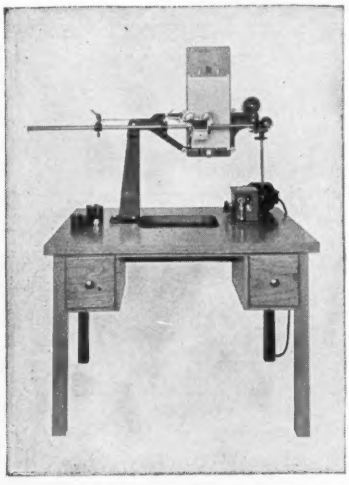
(*Please turn to Page 363*)

Comparative Test on Wire Galvanizing Kettle With and Without Dewalco Liquid Blanket

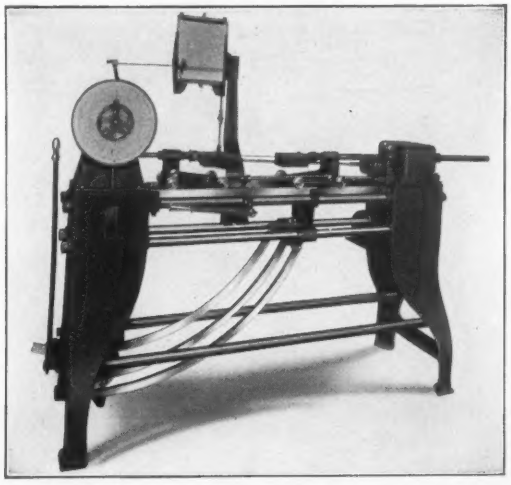
Size of Kettle		**3 ft. x 10 ft.**		
Area of Kettle Covered by Blanket		**24 sq. ft.**		
Kind of Wire		**Fine wire, charcoal wiped.**		
Kind of Zinc		**High Grade**		
Temperature of Zinc		**850°F.**		
Temp. of Surface of Zinc Oxide (when Liquid Blanket not used)		**725°F.**		
Temp. of Surface of Blanket		**315°F.**		
Savings Per 1000 lbs. Zinc Applied to Wire				
	Without Blanket	**With Blanket**	**Unit Cost**	**Saving**
Blanket Used	**None**	**82 lbs.**	**11.0c***	**$-9.02**
Oxide Skimmings Produced	**550 lbs.**	**86 lbs.**	**3.9c****	**18.10**
Dross Produced	**378 lbs.**	**43 lbs.**	**2.6c****	**8.71**
Net Saving per 1000 lbs. Zinc on Wire				**$17.79**

*** Includes 1c per pound freight.**
**** Difference in original cost of high grade zinc content (8c per pound) and sale value of oxide skimmings or dross.**

SCOTT TESTERS



Model IP-2
Maximum capacity
2 pounds



Model Q-5
Maximum capacity
2000 pounds

AUTOGRAPHIC recording tensile testing machines built on either the constant specimen rate of load or constant speed of pull principles. Made in a wide range of models and capacities with high and low stretch magnification recorders - for Wire, Sheet Metals, Rubber, Textiles, Paper, etc.

HENRY L. SCOTT CO.

P. O. BOX 963 PROVIDENCE, R. I.

Extensive Technical Program for 1941 (Forty-fourth) A.S.T.M. Annual Meeting

Sixth Exhibit of Testing Apparatus and Related Equipment

June 23 to 27, Inclusive, Chicago, Ill.

SOME 17 separate technical sessions are being scheduled for the Forty-fourth Annual Meeting of the American Society for Testing Materials to be held at The Palmer House, Chicago, during the week beginning June 23 and extending through Friday, June 27. This number of sessions is necessary for the presentation of the 100 technical papers and reports and to provide time for discussion.

✦ ✦ ✦

THE Sixth Exhibit of Testing Apparatus and Related Equipment will be in progress; the Society sponsors these exhibits, every two years, at its annual meetings. There is also being sponsored the Fourth A. S. T. M. Photographic Exhibit on the general theme "Materials, Testing and Research."

SEPARATE sessions of the meeting will be devoted to such topics as iron, ferro-alloys; water, which includes a Symposium on Problems and Practice in Determining Steam Purity by Conductivity Methods; non-ferrous metals (two sessions); cementitious and building materials; steel, effect of temperature; fatigue of metals, corrosion; plastics; and concrete and concrete aggregates. Also being developed is a joint session with the Western Society of Engineers dealing with three topics of specific local interest, namely, water supply, sewage disposal, and sanitary conditions; and may involve some discussion of materials and problems in connection with the Chicago subway.

✦ ✦ ✦

Rubber Products

AMONG papers of interest to the wire industry the following may be noted:

✦ ✦ ✦

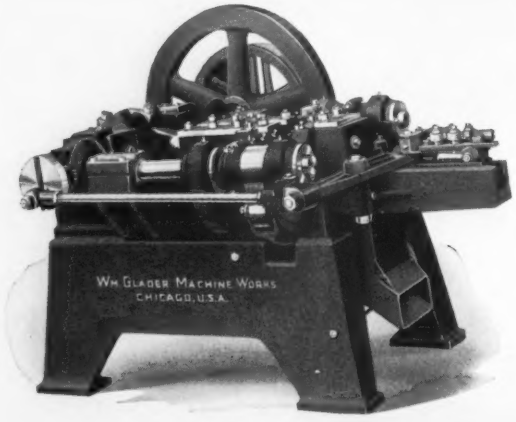
IN addition to the 16th Edgar Marburg Lecture, which this year will be presented by Dr. H. L. Fisher, Director of Organic Research, U. S. Industrial Chemicals, Inc., on the subject "Natural and Synthetic Rubbers"—a separate session is devoted to rubber and electrical insulating materials with several committee reports and technical papers. Methods of testing adhesive tape are to be described and problems involving power factor and dielectric constant of materials will be covered.

✦ ✦ ✦

Non-Ferrous Metals

IN the two sessions devoted to non-ferrous metals there are ten technical papers and eight committee reports, some of the reports being unusually important in view of their relation to National Defense and also because they will contain important data from extensive cooperative research programs. A partial list of topics to be covered in the papers include the following: tensile properties and fatigue tests of some copper alloys, method for determining the density of fine wire, properties of certain lead-bearing alloys, automatic autographic wear measuring device,

HIGH SPEED WIRE NAIL MACHINE



WM. GLADER MACHINE WORKS

210 N. Racine Ave. Chicago, Illinois

Glader Machines on large head, single-blow roofing nails can be seen in operation at any of the independent wire mills in the United States.

The production figures on common nails shown below, are guaranteed.

SIZE MACH.	SIZE WIRE	MAX. LENGTH OF WIRE	NUMBER OF NAILS PER MIN.	CAP. IN POUNDS PER HR.
#00A	#16	1⅛"	700	37.2
#00	#14	1¼"	550	55
#0	#12	1¾"	450	89
#1	#10	2½"	400	192
#2	#8	3½"	325	310
#3	#4	5"	225	523
#4	#1	7"	190	622
#4s	5/16"	9"	175	1155
#5	⅜"	12"	160	2400

This high output and economical operation account for the GLADER machine being accepted as standard equipment in all recent installations.

finishing of aluminum alloy and magnesium alloy die castings, influences of combined external and internal stresses upon the corrosion cracking of brass, and the mercury cracking test (procedure and control).

✦ ✦ ✦

Iron

THE session devoted to iron includes three papers and there will be several committee reports. The topics covered are the strain hardening of gray cast iron, fatigue and static load tests of a high-strength cast iron at elevated temperatures, and Young's modulus and some related properties of graphitic materials.

✦ ✦ ✦

Steel, Stainless Steel, Effect of Temperature

A VERY strong session on these general subjects is being developed with reports of such A. S. T. M. committees as A-1 on Steel, A-10 on Iron-Chromium-Nickel and Related Alloys, and the report of the Joint Research Committee on Effect of Temperature on the Properties of Metals, which this year has appended to it one of the most important compilations of data that the Society will have published, namely, the effect on metals of low temperatures. Outstanding authorities have been compiling and editing these data. The report will fill a long-felt need.

✦ ✦ ✦

CARBON-MOLYBDENUM steel is discussed in two papers, one covering fabrication of carbon-molybdenum pipe for high-temperature service and the other covering the effect of carbide spheroidization. There will also be discussed the stress-strain characteristics of cold-rolled austenitic stainless steels, and a new free-machining addition for stainless steels.

✦ ✦ ✦

Fatigue of Metals, Corrosion

TOPICS to be covered in this session include the effect of shot blasting and its bearing on fatigue, fatigue comparison of 7-in. diameter solid and tubular axles, pitting and its effect on the fatigue limit of steels corroded under various conditions, an accelerated atmospheric corrosion test, and an equation representing the rate of development of rust on galvanized iron sheets.

✦ ✦ ✦

New Bulletin Gives Money Saving Ideas on Maintenance

TO describe the field of application in industry where the Metco Metallizing Process can be used to rehabilitate worn shafts and other rotating machinery, as well as protect metal surfaces against corrosion or chemical attack, METALLIZING ENGINEERING COMPANY, INC., LONG ISLAND CITY, N. Y., has issued a 16-page bulletin, No. 42, entitled "Metco Metallizing Equipment and the Metallizing Process." In addition to facts on how to save time, money and labor in production and maintenance work through Metco Metallizing, this bulletin also describes the Metco "Controlled Power" Metal Spraying Gun and the standard Gun.

All-Metal WIRE SPOOLS

CABLE SPOOLS . . . *for Insulated and Rubber Covered Wire, Solder, and similar products.*

These spool ends are formed from cold rolled steel of gauges to meet specific demands for strength. The edges are curled and ribs embossed for increased rigidity. Panels may be worked into your design and embossed, for use in marking size and variety. All parts are lithographed for identification purposes and to protect the metal.

Ends and traverses may be shipped unassembled. A simple operation on a hand, foot, or power press makes rigid and permanent assembly.

Made in 5", 6½" and 10½" diameter Ends; Traverses 1 15/16" diameter (or special 3½" diameter for 10½" End), in any desired lengths.

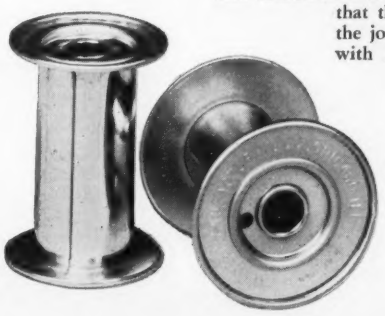
FINE WIRE SPOOLS . . . *for winding and shipping Fine, Steel, Copper, and Enameled Wires.*

Spools are formed from tin plate tested for maximum rigidity. Made with locked-seam barrel and one-piece ends, they are so assembled that there is no possibility of wire being trapped in the joint where barrel and end meet. Ends are made with full curl on edge, which provides additional strength and a smooth winding edge.

Entire spool may be finished with gold lacquer or a variety of colored lacquers; with or without identifying copy embossed in the ends.

Made in 2 7/16" and 3" diameter Ends. The 2 7/16" size is made with 1½" diameter Traverse only; the 3" diameter with 1½" or 1¾" diameter Traverse.

We will send samples at your request.



J. L. CLARK MANUFACTURING CO.
600 23rd AVENUE • ROCKFORD, ILLINOIS

Why Not Change Tool Holders Instead of Tools?

(*Continued from Page 339*)

rect cutting diameter by means of the adjusting screw in the boring bar.

✦ ✦ ✦

IN connection with large turning tools for very large work, there is a possibility for saving a tremendous amount of time and labor, not only in set-up time but also in tool handling and tool grinding. Such tools frequently run up in weight to some 60 or 80 lbs. involving considerable difficulty in handling and grinding.

A SUGGESTED way to overcome this is through the use of a "standard" removable tool mounted in the end of a holder. A design along this line is shown in Fig. 4. Again, in-and-out adjusting screws are provided for the tool. For steel cutting, the use of a holder of the kind shown eliminates the necessity of grinding-in of a chip-breaker in the tool, since the holder itself will act as a chip-breaker. For this purpose, the front of the holder carries a wear-resisting cemented carbide insert at the point where the chip hits the holder. Note that in the design shown, the tool has been given a negative rake at the tip to direct the chip at the 'chip breaker' and prevent its entering into the small space between the tool and the holder. In a design of this kind, the tool can be quickly replaced and easily adjusted. The chip breaker is also 'quick-adjustable,' since the design characteristics of this breaker can be altered by changing either the rake on the tool or the distance of the holder from the tip of the tool.

✦ ✦ ✦

STILL another type of holder is shown in Fig. 5. This is designed as a possible suggestion for use on turret lathes, etc., for mounting of single tools. Here again, the holder complete with tool, would be removed and replaced, rather than replacing the tool alone when grinding is required. This type of holder has a further advantage in that it makes possible the use of small bits—for light cuts—on large machines, and thus provides greater accuracy under such conditions.

✦ ✦ ✦

THESE are just a few suggestions of how this whole subject of tool holders can be approached in a simple fashion to eliminate time loss when it is necessary to change tools. With such holders, time required to change tooling may frequently be a matter of seconds, cutting nonproductive time and increasing output per machine and per man.

✦ ✦ ✦

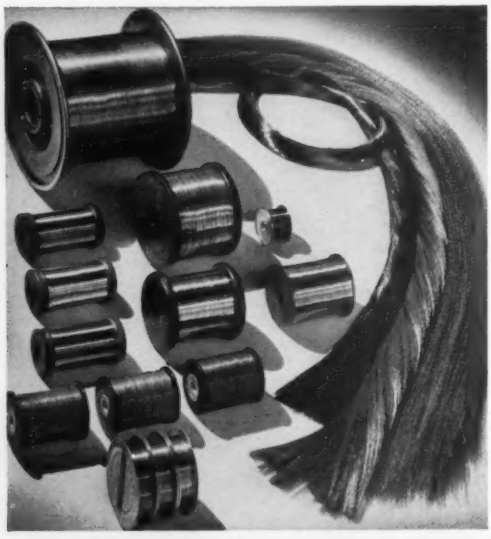
ONE more point that might be brought out is that any increase in simplicity of tool changes will tend to keep the operator from trying to prolong the life of the tool beyond the economical dull point—a frequent cause of excessive grinding requirements and even of tool fracture.

✦ ✦ ✦

INCIDENTALLY if such holders are to be used with carbide tools, dog point screws, or screws with the end ground flat and square with the threads, should be used. Also, tool holders should be designed or installed with a minimum of tool overhang to reduce vibration—a possible cause of a breaking down of the cutting edge.

GOT A SEVERE WIRE FORMING OPERATION?

Callite wires excel in all kinds of wire forming. Callite quality and uniformity — in size, temper and finish — *insure* this. And Callite dependability, under today's stringent defense requirements, *proves* it. Wherever you have a severe wire forming operation, it will pay you to consult Callite. To Callite's trained men, whose special business it is to cooperate with manufacturers, your wire "problems" may be run-of-the-mill. Investigate.



Write for

COMPLETE DETAILS

Aluminum, bronzes, beryllium copper, stainless steel, Everdur, brasses (all grades), nickel-silver and special alloys are available in all fine sizes for wire cloth, wire brushes, and special applications requiring the use of high quality fine wire in sizes down to .002" dia. Write today for details.

CALLITE WIRES

A WIRE FOR EVERY NEED — CALLITE TUNGSTEN — CT

CALLITE TUNGSTEN CORPORATION

572-39th STREET · UNION CITY, NEW JERSEY

Branch Offices: Chicago, Ill. · Cleveland, O.

Reclaiming Water and Waste Materials Profitably

WHEREVER lubricants, tallows, soaps, and water, are used in the manufacturing or drawing of wire and sheets, there always exists a degree of loss of these liquids. Even the continuous use of fresh water is expensive, unless this water is clarified before returning it to the dies and rolls.

✦ ✦ ✦

GOODLY quantities of water, oil, grease, tallow, and copper materials, irrespective of the methods used, find their way into the sewers and waterways, thus being wasted and causing pollution.

✦ ✦ ✦

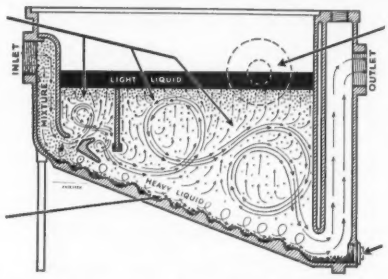
CONDITIONING and cleaning of the water can be accomplished—so it is claimed—by the Gale Conditioner, engineered and constructed by the Gale Oil Separator Co., Inc., Chrysler Building, New York, New York.

UNLIKE any other device on the market, it has no moving parts. It works by gravity, and rolls, bounces, and scrubs every drop of the liquid, cleansing it with scrub-board efficiency.

✦ ✦ ✦

THE unit is scientifically designed and constructed, every corrugation, every baffle, every eddy, and every action being predetermined with definite objective

GALE LIQUID CONDITIONER AND RECLAIMER.



in mind—the separation of the largest possible percentage of foreign ingredients from the fluid at the lowest possible cost, and with the least attention.

This is an invitation for you to become a member of The Wire Association. ✦ ✦ ✦ ✦ ✦ ✦

The Annual Dues are $10.00

THE principle of the Conditioner is based on the difference in specific gravities of substances, and the construction is such as to flow the liquid mixture to be treated beneath a quiescent body of fluid, in such manner that the continual submergence causes the breaking up of the mixture, permitting the lighter liquids, such as, tallow, soap, oil, and grease, immediately and automatically to rise to the surface, and the heavier particles, such as copper and dirt, to settle to the bottom, where provision is made for their removal.

✦ ✦ ✦

THESE Interceptors are now made with capacities ranging from 60 to 2500 gallons per minute, and a number of installations in important mills are reported to be working satisfactorily.

IT'S THE OFFICIAL HEADQUARTERS

The Wire Association

OCTOBER
20 to 24, 1941

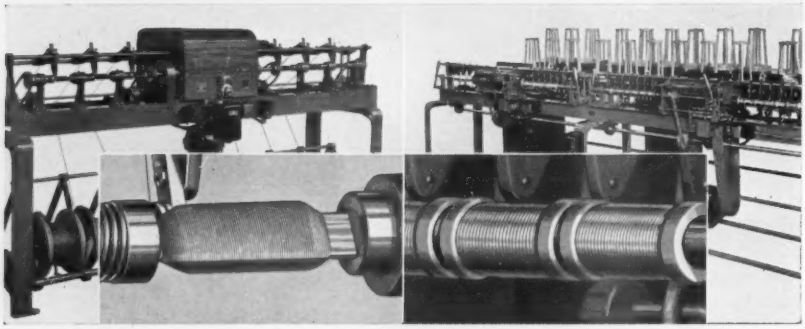
HOTEL PHILADELPHIAN

Entirely redecorated and refurnished, including a radio in every room. Highly recommended by experienced travelers the world over for its warm hospitality; its excellent cuisine served in comfortably air-conditioned restaurants; its convenient location to the business section; and its unlimited parking facilities. 600 *rooms with bath and radio from $3.00 up.*

DANIEL CRAWFORD, JR.
President and General Manager

39th and CHESTNUT STS.
PHILADELPHIA, PENNA.

WIRE SPOOLING MACHINES



On Sticks or Spools . . . from Reels or Coils

Typical of FIDELITY Spooling Machines that you find serving every spooling-operation need of wire industry, these two new types command attention to advanced achievements in precision winding of the wire onto little flat sticks or conventional spools, at new high production rates and new low spooling cost.

You'll be interested especially in the new FIDELITY hydraulic control which eliminates gear changes . . . so write for Bulletin #61.

WIRE SPOOLING, TAPING, WINDING, SINFRA KNITTING, BRAIDING MACHINES

FIDELITY MACHINE COMPANY

3908-18 FRANKFORD AVENUE, PHILADELPHIA, PA.

STEEL WIRE

By MAURICE BONZEL

✦ ✦ ✦

Translated and Published by
Kenneth B. Lewis
Consulting Engineer

✦ ✦ ✦

Price $15.00

✦ ✦ ✦

495 pages. 414 illustrations

✦ ✦ ✦

SEND ORDERS TO

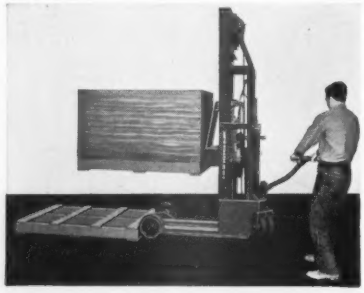
WIRE and WIRE PRODUCTS

300 Main St. Stamford, Conn.

Transporting Pallet Stacker

THE Lewis-Shepard Sales Corporation, 245 Walnut Street, Watertown, Massachusetts, makes public its development during the past fifteen months of a transporting Pallet Stacker for handling materials shipped or stored on double-faced pallets.

✦ ✦ ✦



DESIGNED for use in place of large electric or gas operated fork-type tiering trucks their greatest economy is produced:

a. Where merchandise must be shipped double-decked in freight cars to buyers who use double faced Pallets —but where total amount of handling such materials does not warrant the purchase of an expensive power fork truck;

b. As supplements to the big trucks in rush hours, cramped quarters, or remote part of the building;

c. Where the building elevator capacity prohibits carrying heavy trucks to upper floors; also where the floors themselves cannot support the weight of heavy power trucks;

d. In loading and unloading immediately adjacent to freight car doors, and on comparatively narrow docks.

✦ ✦ ✦

NEW and radically different type of running gear permits operator (1) to approach stacker to pallet and throw lever, braking the wheels. (2) to continue pushing stacker while wheels remain stationary; stacker arms going into the upper pallet and base member into the lower pallet. The wheel base is now 19″ instead 52″. (3) to turn crank and raise load about 6″. (4 to pull stacker towards him, which returns stacker wheel base to its normal 52″.

✦ ✦ ✦

THE illustration shows the Pallet Stacker in transporting position. The running gear is here automatically extended again to the 52″ wheel base, with wheels beneath load, and operator ready to move load to destination.

✦ ✦ ✦

OVERALL height of this stacker allows entrance to freight cars. The large easy-rolling floor wheels give ample underclearance for sills or cramps.

✦ ✦ ✦

New Building Goes up for Torrington Manufacturing Co.

TWENTY thousand square feet of additional floor space will be devoted to the manufacture of Airistocrat propeller fan blades and Airoter Blower wheels upon the completion of a new building just contracted for by the Torrington Manufacturing Company of Torrington, Connecticut.

✦ ✦ ✦

SERIOUSLY overcrowded facilities will be relieved and it is expected that there will be some opportunity for enlargement of present production.

✦ ✦ ✦

THE new building will be one story throughout, and attached to the present plant, leading to a rearrangement of all departments with increased floor space for each. The offices of the fan division will be moved to the second floor of their present building, and floor space doubled.

STEEL REELS AND DRUMS
for
WIRE AND CABLE INDUSTRY
R.B. HAYWARD CO.
1714 Sheffield Ave. Chicago, Ill.

Liquid Blanket for Hot Galvanizing Baths

(*Continued from Page 357*)

zinc oxide when the Blanket was not employed.

✦ ✦ ✦

A NET saving of $35.58 per ton of zinc applied to wire is highly attractive in itself; but of equal importance under today's critical zinc situation is the saving (made possible by decreasing oxide and dross) of 1286 pounds of pure zinc for every ton of zinc actually put on the wire, which was obtained on this wire kettle when galvanizing fine gauge charcoal wiped wire. It is evident that percentage figures will be lower when a heavy gauge wire is galvanized, but that savings will be large irrespective of gauge of wire.

✦ ✦ ✦

The Nozzle-Swirl Process

(*Continued from Page 337*)

of use, not a single blister has been produced by the nozzle-swirl process.

✦ ✦ ✦

CAREFULLY performed bend tests show the completeness of fusion of sheath lead between successive charges, and that there are no oxides remaining in the charge of lead. Sections cut from sample slugs which were given bend tests showed no signs of separation at the area of fusion.

✦ ✦ ✦

SAMPLES of the lead sheath itself, taken at the fusion area, also furnish strong evidence that the nozzle-swirl process eliminates oxidized lead. Etched samples show no sign of flow lines, and hence no oxide inclusion.

✦ ✦ ✦

THE improved concentricity and uniformity of sheath thickness are likewise indication of quality of the cable produced.

✦ ✦ ✦

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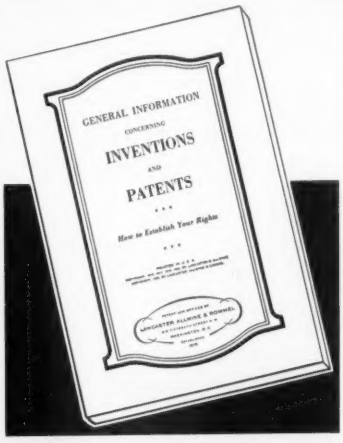

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Defense Contract Service Appeals to Every American Manufacturer

(*Continued from Page 341*)

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✦ ✦ ✦

SUBCONTRACTING and Engineering Section, headed by **Joseph L. Trecker** and **Francis J. Trecker,** of Milwaukee, which supervises the extension of subcontracting work.

✦ ✦ ✦

CONTRACT Section, headed by **Joseph P. Cotton, Jr.,** of New York, which explains—through the regional offices—the terms of various types of contracts used by the War and Navy Departments.

✦ ✦ ✦

SPECIAL Services Section, headed by **Peter R. Nehemkis, Jr.,** of Newark, N. J., which encourages responsible companies to organize groups of subcontractors around them.

✦ ✦ ✦

FIELD Office Section, which coordinates the activities of the 26 field offices.

✦ ✦ ✦

GENERALLY speaking, all regional offices in each Federal Reserve district are under the supervision of a District Coordinator, a man distinguished in the business world.

✦ ✦ ✦

EACH regional office, in turn, is under the immediate supervision of a District Manager or Assistant District Manager, who is a production-minded business man. Technical and business advisors complete the regional office staffs.

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HERE are the locations of the Federal Reserve Banks and branch banks, where regional offices of the Service may be found:

Atlanta, Ga., 104 Marietta Street.

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Birmingham, Ala., Eighteenth Street and Fifth Avenue, North.

Boston, Mass., 30 Pearl Street.

Buffalo, N. Y., 270-276 Main Street.

Charlotte, N. C., 110 South Tryon Street.

(*Please turn to Page 365*)

Defense Contract Service Appeals to Every American Manufacturer

(*Continued from Page 364*)

Chicago, Ill., 230 South La Salle Street.

Cincinnati, Ohio, Fourth and Race Streets.

Cleveland, Ohio, East Sixth and Superior Avenue.

Dallas, Tex., Wood and Akard Streets.

Denver, Colo., Seventeenth and Arapahoe Streets.

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Los Angeles, Calif., Tenth and Olive Streets.

Louisville, Ky., Fifth and Market Streets.

Memphis, Tenn., Third and Jefferson Streets.

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Philadelphia, Pa., 925 Chestnut Street.

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Salt Lake City, Utah, Corner South Temple and East State Streets.

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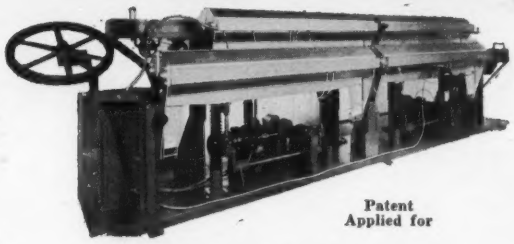

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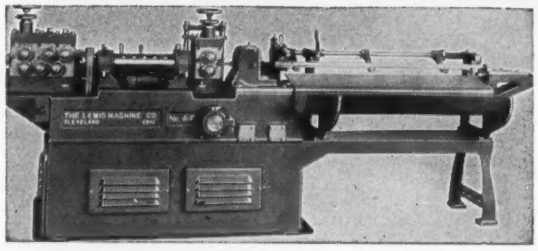

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Machinery Purchases By the Wire Industry for 1939

(*Continued from Page 346*)

OF this amount $691,078, or 20.1% of the total was spent for new construction and alterations to buildings, $2,611,328 representing 75.9% was spent for new machinery and operating equipment.

✦ ✦ ✦

IN addition, $136,651 representing 4% was spent for machinery and equipment acquired in a used condition from other owners.

✦ ✦ ✦

OUT of 669 wire working plants buying wire and fabricating it, 398 plants reported total value of products at $158,816,863. Out of this group the 398 plants reporting produced $138,667,413 or 87.3% of the total.

✦ ✦ ✦

THESE plants spent a total of $4,112,075 for plant and equipment during the year. Of these expenditures $572,620, or 13.9% was spent for new buildings and plant. New machinery and operating equipment amounting to $3,099,297 or 75.4% of the total expenditures were made and used machinery to the amount of $439,885 or 10.7% of the total was also purchased.

✦ ✦ ✦

Bright Copper Plating Process

A NEW, bright copper plating process has been developed by Dr. Louis Weisberg.

✦ ✦ ✦

DUE to the shortage of nickel, many concerns will be forced to find ways and means of getting along with less, and this method of applying heavier copper deposits, followed by a comparatively light nickel deposit, will accomplish this end.

✦ ✦ ✦

THE use of the new, bright heavy copper plating process will therefore prove advantageous as a nickel conservation measure, as well as a practical means of keeping products on the production line moving through. The method is efficient and effective, and is applicable to rod, wire, tube and strip as well as batch plating.

✦ ✦ ✦

FOLLOWING is a summary of the salient facts about this process.

1. **The basic ingredients of the solution are copper sulphate, diethylene triamine and ammonium sulphate.**
2. **The copper is in the bivalent form.**
3. **The current efficiency at both anode and cathode is practically 100%.**
4. **The throwing power compares favorably with a cyanide copper solution and is much better than an acid copper solution.**
5. **The average current density is about 40 amperes per square foot for optimum brightness.**
6. **The bright plating range extends from practically zero up to over 100 amperes per square foot on certain simple types of work.**
7. **A moving cathode is recommended.**
8. **Anodes are preferably of electrolytic copper (cathode) although cast copper anodes may be and have been used.**
9. **Operating temperature is approximately 140° F.**
10. **Rubber lined equipment - - - tank and filter are required.**
11. **Regular filtration is necessary to keep the solution clean.**
12. **Heating can be provided by means of a copper coil or a Duriron heat exchanger.**
13. **A cyanide copper flash before plating on zinc or steel is required. This need not be more than a two or three minute flash, except on pieces carrying heavy scale, such as bumpers where about 0.0001" of cyanide copper is recommended. Either a Rochelle salt solution or an ordinary cyanide copper solution may be used for the flashing.**

THE Hanson-Van Winkle-Munning Co., Matawan, N. J., is the sole selling agent for this process. Detailed information may be obtained either by addressing them or the Editor of WIRE & WIRE PRODUCTS.

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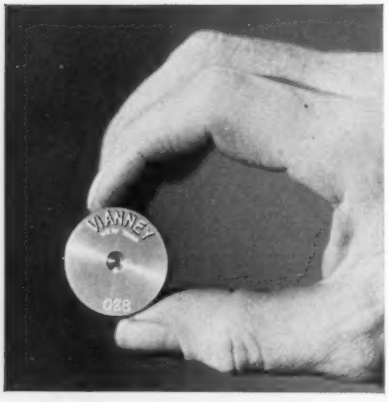

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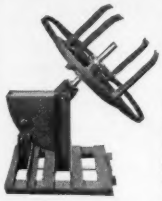
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New Catalog Published by Brown Instrument Company

THE Brown Instrument Company, Philadelphia, Pa., has just issued a new Catalog, No. 77-1 — "Brown and Mineapolis-Honeywell Industrial Power Units and Motorized Valves."

✦ ✦ ✦

THIS catalog describes a line of motor power units and motorized valves designed to operate with Brown control Instruments and form an important part of the control system. By using a control instrument and control motor designed specifically for each other, the best results are obtainable.

✦ ✦ ✦

PROFUSELY illustrated, actual photographs are shown of electric control motors, slip stem globe type, rotary stem globe type, butterfly type, pilot operated, threeway and special valves. Dimension tables and schematic diagrams give an accurate idea of workmanship and operation.

✦ ✦ ✦

COPIES of this catalog may be obtained by addressing the Editor, WIRE & WIRE PRODUCTS.

✦ ✦ ✦

Corrosion Resistant Paint

A NEW bulletin, No. 1610, on "TYGON" Corrosion-Resistant Tank Linings and "TYGON" Paint was recently issued by the United States Stoneware Company, 60 East 42nd Street, New York, N. Y.

✦ ✦ ✦

ATTENTION is called particularly to the "TYGON" Corrosion-Resistant Paint as described on the last two pages of this Bulletin. "TYGON" Paint is proving extremely popular for general industrial use.

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Metals, Nonferrous
European Quicksilver Monopoly Broken

THE virtual monopoly of the world quicksilver market exercised in recent years by Italo-Spanish interests appears definitely to be ended as a result of the rapidly expanding production of the metal in non-European countries, according to an authoritative article published in a leading British journal. ✦ ✦ ✦

IN the period immediately preceding the outbreak of the present war, the article states, Italy and Spain together accounted for four-fifths of the world's quicksilver output and through a joint cartel they were able effectively to control prices.

✦ ✦ ✦

SINCE the beginning of hostilities quicksilver production has been resumed in British Columbia, and in Peru and China production has been stepped up. The greatest advance, however, has been made in the United States where the current output is running at the rate of approximately 50,000 flasks a year. Only about 30,000 flasks are required for American industries and last year for the first time on record quicksilver was exported from the United States to British markets. Apart from the growing United States surplus, almost the entire output of Mexican quicksilver is available to Great Britain so even the loss of Spanish supplies could no longer endanger British requirements of the metal. ✦ ✦ ✦

THE expanding output of quicksilver outside of Europe, it is pointed out, represents a severe blow to the Italo-Spanish cartel, the full effects of which will not be felt until after the war when military consumption ceases and civilian industries again become the chief consumers.

✦ ✦ ✦

Allan B. Dove

ALLAN B. DOVE, one of the members of the Wire Association and until recently connected with the Engineering Department of the Steel Company of Canada, Ltd., at Montreal, is now overseas as an officer with the Royal Canadian Engineers.

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Norton Co., Worcester, Mass.

ACCUMULATORS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.

AIR DRAW FURNACES—
Carl-Mayer Corp., The, Cleveland, Ohio.

ANNEALING MACHINES—Open Flame
Drever Co., The, Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

ANNEALING POTS AND BOXES—
National Annealing Box Co., Washington, Penna.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.

ARMORING EQUIPMENT—
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

AUTOMATIC SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

BAKERS—Hi-Speed
Carl-Mayer Corp., The, Cleveland, Ohio.

BAKERS—Rod and Wire
Carl-Mayer Corp., The, Cleveland, Ohio.
Morgan Construction Co., Worcester, Mass.
Moslo Machinery, Inc., Cleveland, O.
Ross, J. O., Engineering Corp., New York, N. Y.

BANBURY MIXERS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.

BERYLLIUM COPPER—Strip and Bars
Callite Tungsten Corp., Union City, N. J.

BLOCKERS—
Farrel-Birmingham Co., Inc., Ansonia, Conn.

BOBBINS—Braider and Wire Weaving
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

BORON CARBIDE—
Norton Co., Worcester, Mass.

BRICKS—Acid Proof
Keagler Brick Co., Steubenville, Ohio.

CALIPERS—Roll
Farrel-Birmingham Co., Inc., Ansonia, Conn.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CASTINGS—Wire Mill
Farrel-Birmingham Co., Inc., Ansonia, Conn.

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CHEMICALS—Cleaning
Standard Industrial Compounds Co., Chicago, Ill.

CLEANERS—Hand and Metal
Standard Industrial Compounds Co., Chicago, Ill.

CLEANING & PICKLING EQUIPMENT—
Broden Construction Co., Cleveland, O.
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Lee Wilson Engineering Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CLOTH TESTERS—
Scott, Henry L., Co., Providence, R. I.

CLOTH—Wire, All Metals
Callite Tungsten Corp., Union City, N. J.

COATING—Protective
American Lanolin Corp., Lawrence, Mass.

COILERS—Sheet, Strip and Wire
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.

COILERS AND SPOOLERS FOR INSULATED WIRES—
Entwistle, James L., Pawtucket, R. I.

COLD HEADERS—
Waterbury Farrel Fdry. & Mach. Co., Waterbury, Conn.

COMPOUNDS—Wire Drawing
Standard Industrial Compounds Co., Chicago, Ill.

WHERE TO BUY, Continued

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Vascoloy-Ramet Corp., North Chicago, Ill.

DIAMONDS—Industrial
Callite Tungsten Corp., Union City, N. J.

DIAMOND POWDERS—
Rusch Wire Die Corp., New York, N. Y.

DIAMOND TOOLS—
Rusch Wire Die Corp., New York, N. Y.

DIES—Diamond
Cochaud Wire Die Corp., New York, N. Y.
Fort Wayne Wire Die, Inc., Fort Wayne, Indiana
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Inc., Jersey City, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Jersey City, N. J.

DIES—Lead Extrusion
Robertson, John, Co., Brooklyn, N. Y.

DIES—Repairs & Re-Cutting
Carboloy Co., Inc., Detroit, Mich.
Cochaud Wire Die Corp., New York, N. Y.
Firth-Sterling Steel Co., McKeesport, Pa.
Fort Wayne Wire Die, Inc., Fort Wayne, Indiana
Kelly Wire Die Corp., New York, N. Y.
Krause, F., & Co., Inc., Jersey City, N. J.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.
Wayne Wire Die Co., Jersey City, N. J.

DIES—Rod and Tube Drawing
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tantalum Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIES—Tungsten Carbide
Carboloy Co., Inc., Detroit, Mich.
Firth-Sterling Steel Co., McKeesport, Pa.
Kelly Wire Die Corp., New York, N. Y.
Rusch Wire Die Corp., New York, N. Y.
Tungsten Electric Corp., Union City, N. J.
Vascoloy-Ramet Corp., North Chicago, Ill.
Vianney Wire Die Works, New York, N. Y.

DIRECT ELECTRIC RESISTANCE HEAT TREATING
Trauwood Engineering Co., Cleveland, Ohio.

DRAW BENCHES—
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Standard Machinery Co., Providence, R. I.
Vaughn Machinery Co., Cuyahoga Falls, O.

DRUMS—Flange Steel
Stevens Metal Products Co., Niles, O.

DRUMS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

ENGINEERS—Consulting Wire Mill
Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

EQUIPMENT—Insulation Testing
Davis, R. L., Electric Co., Wallingford, Conn.
Entwistle, James L., Pawtucket, R. I.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FLASH BAKER—
Carl-Mayer Corp., The, Cleveland, Ohio

FLUX—Galvanizing
Dewey & Almy Chemical Co., Cambridge, Mass.

FURNACES—Annealing
Carl-Mayer Corp., The, Cleveland, Ohio.
Drever Co., The, Philadelphia, Pa.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Automatic
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Brazing
Electric Furnace Co., Salem, O.
Firth-Sterling Steel Co., McKeesport, Pa.

FURNACES—Bright Annealing
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Electric
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Hardening and Tempering
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio.

FURNACES—Lead Melting
Electric Furnace Co., Salem, O.
Robertson, John, Co., Brooklyn, N. Y.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Non-Oxidizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Normalizing
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Salt Bath
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo, Ohio.

FURNACES—Wire, Strip & Sheet
Carl-Mayer Corp., The, Cleveland, Ohio.
Electric Furnace Co., Salem, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Surface Combustion Corp., Toledo, Ohio.

GALVANIZING EQUIPMENT—
Lee Wilson Engineering Co., Cleveland, Ohio

GALVANIZING FLUX—
Dewey & Almy Chemical Co., Cambridge, Mass.

GALVANIZING KETTLES—
National Annealing Box Co., Washington, Penna.

GATES—Blast, For Low Pressure Air
Farrel-Birmingham Co., Inc., Ansonia, Conn.

GEARS—Continuous Tooth Herringbone
Farrel-Birmingham Co., Inc., Ansonia, Conn.

GEARS—Wire Mill
Farrel-Birmingham Co., Inc., Ansonia, Conn.

GRINDERS—Roll
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Norton Co., Worcester, Mass.

HI-SPEED BAKERS—
Carl-Mayer Corp., The,, Cleveland, Ohio.

HOISTS—Electric Travelling
Cleveland Tramrail div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

INSTRUMENTS—Electrical
Entwistle, James L., Pawtucket, R. I.

KETTLES—Galvanizing, Annealing, Tinning, etc.
Farrel-Birmingham Co., Inc., Ansonia, Conn.

LATHES—Die Reaming
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

LIQUID FOAM BLANKET—
Dewey & Almy Chemical Co., Cambridge, Mass.

LUBRICANTS—For Metal Cutting Stamping and Drawing
Standard Industrial Compounds Co., Chicago, Ill.

LUBRICANTS—Wire Drawing
Standard Industrial Compounds Co., Chicago, Ill.

MACHINERY — Armoring (Cable, Wire Hose)
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Braiding
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Brazing
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Bunching
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

MACHINERY—Cable, Electric
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass
Watson Machine Co., Paterson, N. J.

MACHINERY—Chain Making
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Closing
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Coil Winding
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Coilers
Broden Construction Co., Cleveland, O.
Entwistle, James L., Pawtucket, R. I.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Copper Wire Drawing and Rolling
Cook, John. Engr. Co., Paterson, N. J.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Covering Wire
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Cutting
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Die Making
Firth-Sterling Steel Co., McKeesport, Pa.

MACHINERY—Draw Benches
Standard Machinery Co., Providence, R. I.

MACHINERY—Edging
Standard Machinery Co., Providence, R. I.

MACHINERY—Enameling
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Extruding
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

WHERE TO BUY, Continued

MACHINERY—Flat Wire
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Forming
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.

MACHINERY—Galvanizing
Lee Wilson Engineering Co., Cleveland, Ohio

MACHINERY—Galvanizing Wire
Broden Construction Co., Cleveland, O.
Lee Wilson Engineering Co., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Gang Winders
Fidelity Machine Co., Philadelphia, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Grinding
Norton Co., Worcester, Mass.

MACHINERY—Grinding, Roll
Farrel-Birmingham Co., Inc., Ansonia, Conn.

MACHINERY—Insulating
American Insulating Mach'y. Co., Phila., Pa.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Philadelphia, Pa.

MACHINERY—Lead Encasing
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Robertson, John, Co., Brooklyn, N. Y.

MACHINERY—Lead Stripping
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Magnet Wire
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Material Handling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MACHINERY — Measuring Wire & Cable
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Panning
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Paper Covering Wire
Terkelsen Machine Co., Boston, Mass.

MACHINERY—Pointing
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rod Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Rolling Mill
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Rubber for Insulating Wire
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Royle, John, & Sons, Paterson, N. J.

MACHINERY—Rubber Strip Covering
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Rubber Tubing and Straining
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Screw Wire
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Special
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Farrel-Birmingham Co., Inc., Ansonia, Conn.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spooling
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

MACHINERY—Spring Making
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Straightening
Broden Construction Co., Cleveland, O.
Hallden Machine Co., Thomaston, Conn.
Lewis Machine Co., The, Cleveland, O.
Moslo Machinery, Inc., Cleveland, O.
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Stranding
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Strip Steel
Broden Construction Co., Cleveland, O.
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Swaging
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Taping
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass
Watson Machine Co., Paterson, N. J.

MACHINERY—Testing
Entwistle, James L., Pawtucket, R. I.
Scott, Henry L., Co., Providence, R. I.

MACHINERY—Testing Size of Wire
Davis, R. L., Electric Co., Wallingford, Conn.

MACHINERY—Testing—Spring
Standard Machinery Co., Providence, R. I.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Trolley Wire
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill
Ruesch, H. J., Machine Co., Newark, N. J.

MACHINERY—Welding Wire
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

MACHINERY—Winding
American Insulating Mach'y. Co., Phila., Pa.
Entwistle, James L., Pawtucket, R. I.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Drawing
American Insulating Mach'y. Co., Phila., Pa.
Broden Construction Co., Cleveland, O.
Cook, John, Engr. Co., Paterson, N. J.
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Machine Co., Waterbury, Conn.

MACHINERY—Wire Measuring
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Rope
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

MACHINERY—Wire Tinning
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

MACHINERY—Wood Screw
National Machinery Exchange (Used), New York, N. Y.

MACHINERY—Wrapping Wire
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

MILLS—Rod, Bar, etc.
Farrel-Birmingham Co., Inc., Ansonia, Conn.

MILLS—Strip, Hot and Cold For Iron, Steel, Copper, Brass, etc.
Farrel-Birmingham Co., Inc., Ansonia, Conn.

MILLS—Tandem Rolling and Edging
Standard Machinery Co., Providence, R. I.

NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip
Hudson Wire Co., Ossining, N. Y.

OILS—Wire Drawing
Standard Industrial Compounds Co., Chicago, Ill.

OVENS—Industrial
Carl-Mayer Corp., Cleveland, Ohio.
Ross, J. O., Engineering Corp., New York, N. Y.

PANS—Lead and Spelter
National Annealing Box Co., Washington, Penna.

PANS—Vulcanizing
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

PAPER—Creped Wrapping
Crepe-Kraft Co., Inc., Newark, N. J.

PAPER TESTERS—
Scott, Henry L., Co., Providence, R. I.

PATENT ATTORNEYS—
Lancaster, Allwine and Rommel, Washington, D. C.

PICKLING TANK LININGS—
Keagler Brick Co., Steubenville, Ohio.

PLASTIC TESTERS—
Scott, Henry L., Co., Providence, R. I.

POTS—Lead Melting
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Robertson, John, Co., Brooklyn, N. Y.

PRESSES—Hydraulic and Mechanical
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

PRESSES—Lead
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Robertson, John, Co., Brooklyn, N. Y.

PRESSURE VESSELS—
National Annealing Box Co., Washington, Penna.

PULLERS—Wire
Scudder, E. J., Fdry. & Machine Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

PUMPS—Hydraulic
Robertson, John, Co., Brooklyn, N. Y.

RECORDERS—Fault and Reel
Entwistle, James L., Pawtucket, R. I.

REEL AND TENSION STAND—
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, O.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

REEL CRUTCHES—
Watson Machine Co., Paterson, N. J.

REELS—Annealing and Stranding
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Constant Tension
Farrel-Birmingham Co., Inc., Ansonia, Conn.

REELS—Steel
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REELS AND SPOOLS—Shipping and Shop
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, Ohio.

REELS—Takeoff
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Vulcanizing and Impregnating
Apco Mossberg Co., Attleboro, Mass.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

REELS—Wire Drawing
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

REFRACTORIES—High Temperature
Norton Co., Worcester, Mass.

ROD BAKERS—
Carl-Mayer Corp., The, Cleveland, Ohio.
Moslo Machinery, Inc., Cleveland, O.
Ross, J. O., Engineering Corp., New York, N. Y.

RODS—Wire—Non-Ferrous
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

RODS—Wire—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

ROLLS—Iron, Steel, Alloy
Farrel-Birmingham Co., Inc., Ansonia, Conn.

ROLLS—For Strip, Rod, Bar Mills
Farrel-Birmingham Co., Inc., Ansonia, Conn.

ROLL STRAIGHTENERS—
Moslo Machinery, Inc., Cleveland, O.

RUBBER AND RUBBER COMPRESSION TESTERS—
Scott, Henry L., Co., Providence, R. I.

RUST PROOF COMPOUND—
American Lanolin Co., Lawrence, Mass.

SHEET—Steel
Jones & Laughlin Steel Corp., Pittsburgh, Pa.

SOAPS—Industrial and Wire Drawing
Standard Industrial Compounds Co., Chicago, Ill.

SOLDER—
Kester Solder Company, Chicago, Ill.

SPARK TESTING EQUIPMENT—
Entwistle, James L., Pawtucket, R. I.

SPOOLS—Annealing and Wire Drawing
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Chicago, Ill.

SPOOLS—Shipping and Shop
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPOOLS—Steel
American Pulley Co., Philadelphia, Pa.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hayward, R. B., Co., Chicago, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

SPRINGS—Made on Contract
American Wire Products Co., Brooklyn, N. Y.

STAMPINGS—Steel
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Brass and Non Ferrous
Hudson Wire Co., Ossining, N. Y.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

STRIP METAL TESTERS—
Scott, Henry L., Co., Providence, R. I.

SWIFTS—Take-off
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

TAKE-UPS FOR CABLE, HOSE, LEAD PRESSES AND SHEET RUBBER—
Entwistle, James L., Pawtucket, R. I.

TANK LININGS—Brick
Keagler Brick Co., Steubenville, Ohio.

TANKS—Compound
Watson Machine Co., Paterson, N. J.

TANKS—Steel
Mossberg Pressed Steel Corp., Attleboro, Mass.

TENSILE TESTERS—
Scott, Henry L., Co., Providence, R. I.

TESTING INSTRUMENTS—
Entwistle, James L., Pawtucket, R. I.
Scott, Henry L., Co., Providence, R. I.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

TREADS—Safety
Norton Co., Worcester, Mass.

TRUCKS—
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

TUBE BENDERS AND FORMERS—
Ruesch, H. J., Machine Co., Newark, N. J.

TURKS HEADS—Friction and Power Driven
Standard Machinery Co., Providence, R. I.

VULCANIZERS—
Watson Machine Co., Paterson, N. J.

VULCANIZING PANS—
American Insulating Mach'y. Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

WELDERS—Spot and Butt
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, O.

WIRE—Cold Heading
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE DRAWING — High Grade Custom
Hy-Carbo Steel Co., Lowell, Mass.

WIRE—Electric
Hudson Wire Co., Ossining, N. Y.

WIRE—Enameled For Coils
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE—Manufacturers
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Nickel Silver and Phosphor Bronze
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

WIRE—Non Ferrous to Specification For Special Purposes
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

WIRE SOLDER—
Kester Solder Company, Chicago, Illinois

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Stainless Steel—
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

WIRE—Steel—Also Coppered Steel—Also Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Jones & Laughlin Steel Corp., Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE AND STRIP—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WIRE TESTERS—
Scott, Henry L., Co., Providence, R. I.

WIRE, WEAVING—Non Ferrous
Hudson Wire Co., Ossining, N. Y.

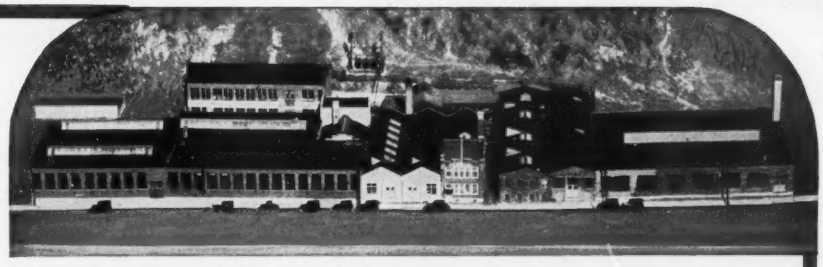
WRAPPING PAPER—Creped
Crepe-Kraft Co., Inc., Newark, N. J.

YARN TESTERS—
Scott, Henry L., Co., Providence, R. I.

HUDCO

SPECIALIZES

WINCO



HUDSON WIRE CO. PLANT AT OSSINING, N. Y.

HUDCO AT OSSINING PRODUCES FINE WIRES IN ALL METALS.

FINE BARE WIRES

High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver, 10%, 18%, and 30%; Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickel Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

"HUDCO" SPECIALLY PROCESSED COPPER WIRE FOR ENAMELLING PURPOSES IS DRAWN FROM SELECTED COPPER, INSURING THE MAXIMUM CONDUCTIVITY. THIS SELECTION PLUS OUR LONG EXPERIENCE AND UNEXCELLED PLANT FACILITIES INSURE OUR CUSTOMER BETTER WIRE AT LOWER COST.

WRITE TODAY FOR SAMPLES AND PRICES —

HUDSON WIRE COMPANY
OSSINING, N. Y.

ESTAB. 1902 SUCCESSORS - ROYLE AND AKIN

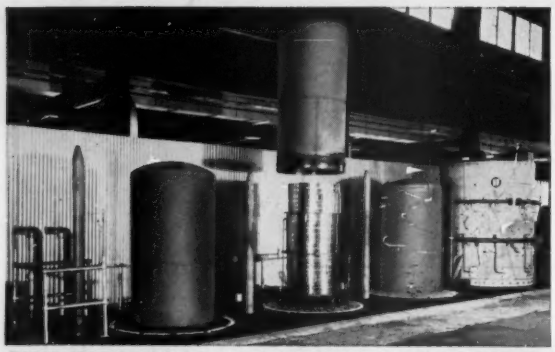
WINCO AT WINSTED, CONN. PRODUCES LEAKPROOF ENAMELLED WIRE AND OTHER WINCO ENAMELLED AND COVERED WIRES.

WRITE FOR SAMPLES AND PRICES —

WINSTED DIVISION
HUDSON WIRE COMPANY
WINSTED CONNECTICUT

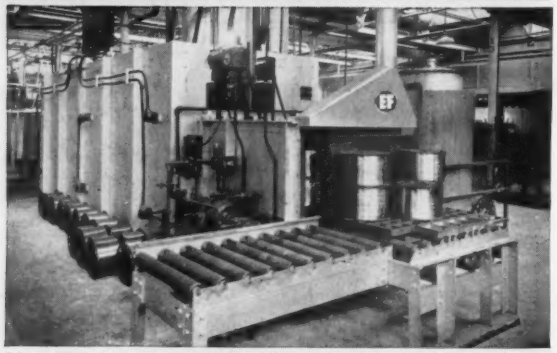
EF FURNACES

For Every Industrial Heat Treating Process



Bright Annealing Strip, Wire, etc.

An E. F. gas fired removable hood or bell type furnace equipped with separate automatically controlled zones, circulating fans, special radiant type gas burners, and other E. F. features as used for bright annealing strip, wire in coils, etc.

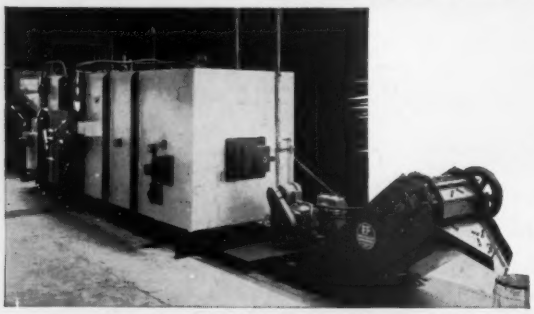


Bright Annealing Copper Wire

An E. F. special atmosphere pusher type furnace for bright annealing both heavy and fine copper wire on large reels, on spools, and in coils. The trays are equipped with bulkheads for retention of atmosphere. Built in various sizes.

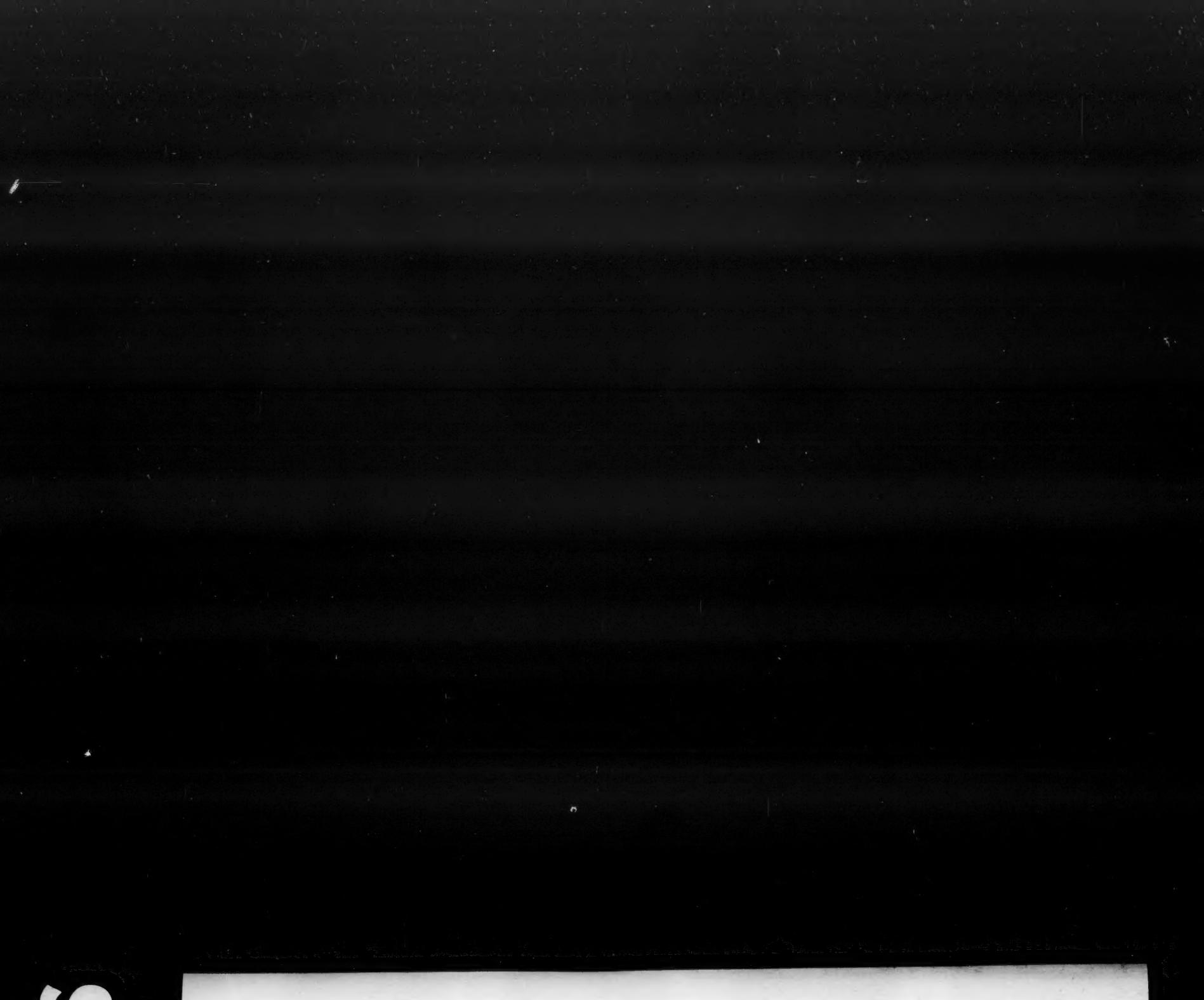
Normalizing and Annealing Rod

An E. F. circular pit type furnace equipment with retort into which the charge is lowered and sealed. The protective atmosphere is allowed to flow through the retort displacing oxygen and preventing decarburization or formation of scale.



Clean Hardening Bolts, Springs, etc.

An E. F. chain belt scale free hardening furnace with quenching equipment—handles all kinds of products such as bolts, springs, bearing parts, gears, etc.—Built in sizes for handling from 300 to 1700 pounds per hour—continuously.

We build furnaces for bright annealing, scale-free hardening, forging, copper brazing, nitriding, normalizing, billet heating, and for every other heat treating process. We solicit your inquiries.

The Electric Furnace Co., Salem, Ohio